TQH340-35Y 套管动力钳使用说明书
Instruction for Model TQH340-35Y Hydraulic Power Tong
（2012 版 • VERSION OF 2012）

生产许可
XK14-002-00018

• 本公司已通过 API 产品质量认证

OUR CORPORATION HAS PASSED ATTESTAION OF API Spec 7K

吊钳授权号 TONGS ACCREDIT NO.：*API Spec 7K – 0055*

• 本公司已通过 ISO9001–2008 质量体系认证

OUR CORPORATION HAS PASSED ATTESTAION OF ISO9001–2008 QUALITY SYSTEM

证书号 CERTIFICATE NO.：*01410Q10448R4M*

• 本公司生产的吊钳、卡瓦、吊卡、吊环已获全国工业产品生产许可证办公室颁发的生产许可证

WE HAVE THE LICENCE ISSUED BY THE OFFICE OF THE NATIONAL INDUSTRY PRODUCT PERMITTED PRODUCTION FOR THE MANUAL TONGS, ROTARY SLIPS, ELEVATORS AND LINKS.

安全事项

WARNING

本手册所述设备是一种外露旋转的液压机械工具，为了避免对操作人员及相邻员工造成严重的人身伤害和对设备造成严重的损坏，在操作该设备前一定要阅读本说明书并理解和遵守。

The equipment described in this manual is a powerful hydro-mechanical tool with exposed rotating components. To avoid serious body injury to operating and adjacent personnel and mechanics, the warning noted on the equipment and in this manual must be read, understood and followed.

目　录

Table of Contents

一、　概述
Section 1　General Description
二、　主要技术参数
Section 2　Main Technical Specifications
三、　主要部件结构及工作原理
Section 3　Structure And Working Principle
1. 液压系统 Hydraulic System
2. 传动系统 Gear Train and Clutch
3. 颚板系统 Jaw System
4. 液压动力站 Hydraulic Power
5. 弹簧筒 Spring Hanger
6. 扭矩仪 Torque Gauge Assembly
四、　安装
Section 4　Installation
1. 钳子空间要求 Tong Space Requirement
2. 悬吊 Hang The Tong
五、　操作
Section 5　Operation
1. 操作说明 Operating Indicators
2. 操作前的检查 Preoperating Checks
3. 操作检查 Operational Checkout
4. 悬起动力钳，关闭钳门 Positioning Tong and Enclosing Casing
5. 操作方法 Operating The Tong
六、　维护
Section 6　Maintenance
1. 日常检查 Daily Inspection
2. 每月检查 Monthly Maintenance
3. 润滑 Lubrication
4. 齿轮润滑 Gear Grease
七、　试车和调整
Section 7　Test and Adjustment
1. 锁闩调整 Door Latch Adjustment
2. 大齿圈对中调整 Rotary Centering Adjustment
3. 换挡手柄的调整 Shifting Locator Pin Adjustment
八、　常见故障及修理
Section 8　Troubleshooting and Repair
九、　动力钳的拆卸及零件明细
Section 9　Disassembly and Parts
1. 大齿圈拆卸及零部件明细表 Rotary Assembly, Disassembly and Parts
2. 颚板总成和零部件明细表 Jaw Assembly and Parts
3. 钳体总成和零部件明细表 Tong Case Body Assembly and Parts
4. 齿轮箱总成和零部件明细表 Gear Box Assembly and Parts

一、概述 General Description

TQH340-35Y 是一款由液压马达驱动的套管动力钳，能够卡持φ140～φ340（5.1/2~13.3/8in）的管柱；可通过更换齿圈和颚板卡持φ340～φ406（13.3/8～16in）的管柱，通过另配颚板卡持φ101～φ140（4～5.1/2in）的管柱。套管动力钳力臂 813（32in），最大扭矩为 35kN・m（25,815lb・ft）。

Model TQH340-35Y is a hydraulic motor-driven tong capable of running pipe or casing from 5.1/2 to 13.3/8 inches in diameter. Changing the rotary and jaws, the power tong can run pipe or casing from 13.3/8 to 16 inches in diameter. If change the jaws, the tong can run pipe or casing from 4 to 5.1/2 inches in diameter. With a 32 inch (813mm) handle, the tong can produce up to 25,815lb・ft.(35KN・M) in low gear, forward or reverse operation.

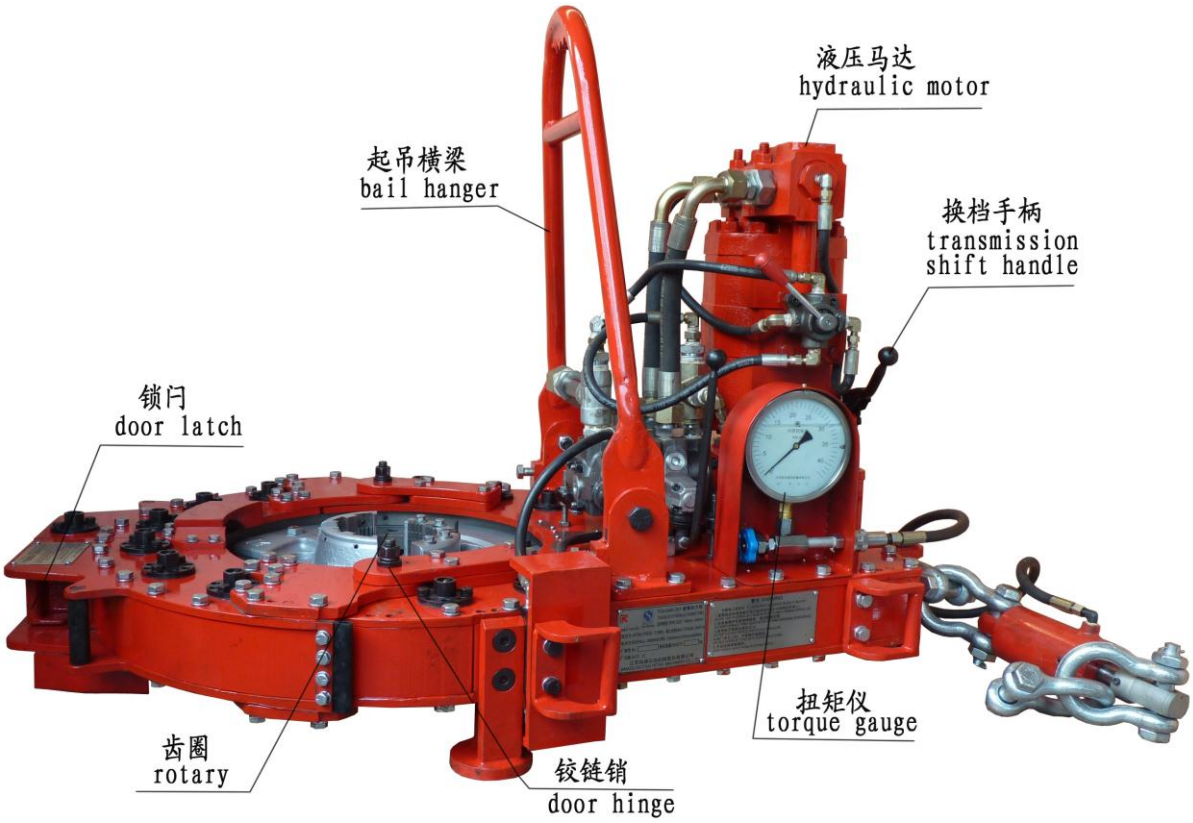

图 1 主要元件

Figure 1 Functional Elements

二、主要技术参数 Main Technical Parameter

1、主要技术规范见表 1 Main technical parameter:

表 1 液压套管钳主要技术参数

Table 1 Main technical parameter:

序号	参数 / 型号		TQH340-35Y
1	适用管径 Casing size	mm	φ140～φ340
		in	5.1/2~13.3/8
2	液压系统最大工作压力 Maximum working pressure	MPa	17.5
		psi	2500

3	液压系统额定流量 Rated flow	L/min	227
		gpm	70
4	低速档最大扭矩 Maximum torque for low gear	N・m	35000
		lbf・ft	25815
5	高速档最大扭矩 Maximum torque for high gear	N・m	8535
		lbf・ft	6295
6	钳头转速 Maximum rpm	高速档(High Gear) rpm	47
		低速档(Low Gear) rpm	11
7	外形尺寸 Dimension	mm	1358×820×993
		in	53.5×32.3×39.0
8	重量 Weight	kg	685
		lb	1507

2、TQH340-35Y 套管动力钳的性能曲线示意图

Typical performance curve for model TQH340-35Y power tong

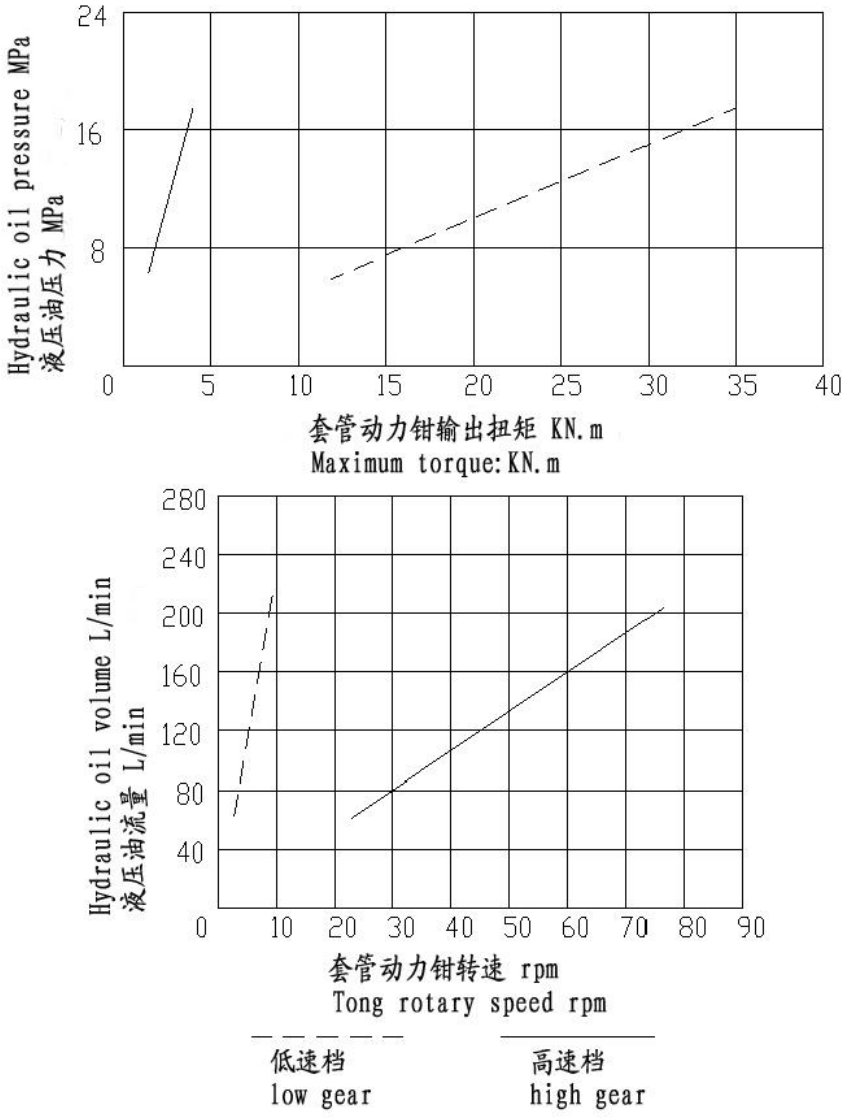

图 2 套管动力钳性能曲线图

Figure 2 typical performance curve for the tong

三、主要部件结构及工作原理
Main structure and Working Principle

液压套管钳由液压马达驱动，马达采用单联或双联传动装置结构，通过齿轮箱和液压动力装置提供驱动力。在操作时，用钢索将套管钳悬挂在井口上，并用备用绳索阻止钳因转矩力围统管柱转动，并提供反扭矩。

The casing tong incorporates a tandem gear-type, fixed-displacement, hydraulic motor to provide power through a gear box and power train. In operation, the tong is suspended over the well bore on a cable. A back-up line restrains the tong from moving around the pipe as torque is applied.

1、液压系统 Hydraulic System

液压系统由液压动力站、液压马达、控制阀、减压阀、快速接头、管线等组成。

Hydraulic system is composed of hydraulic power unit, hydraulic motor, control valve, relief valve, quick connectors and lines.

液压套管钳由一个单独的动力装置提供液压动力，通过软管连接。为了防止软管错接，高压进油管使用 1in 接头，而回油管使用 1.1/4in 接头。

Hydraulic pressure from a separate power unit is applied through hose connectors. To prevent cross-connection of the hoses, the pressure hose is designed to mate with a 1 inch connector and the return hose with a 1.1/4 inch connector.

操纵手柄控制着钳子的控制阀，把手柄推向前去，则马达正转进行上扣操作；把手柄向后拉，则马达反转，进行卸扣操作；将手柄置于中间位置，则高压油经过控制阀自由流到回油管线，则马达卸荷。

The throttle handle controls the throttle valve for the unit. Pushing the handle applies pressure to drive the motor forward (for make-up operation) and pulling the handle applies pressure in a reverse direction (for breakout operation). While the handle is in a neutral position, fluid circulates freely through the valve and back to the return line.

2、传动系统 Gear Train and Clutch

颚板的夹紧和旋转是通过齿圈完成的。液压齿轮马达通过变速箱和齿轮传输机械动力使齿圈转动。

Closure and rotation of the pipe-gripping jaws are accomplished by a large rotary gear. Mechanical power is transmitted from the hydraulic motor to turn the rotary gear in either direction.

整个套管动力钳的齿轮传动系统如图 3 所示。齿轮传动系统包含一个安装在套管动力钳上面板上的变速箱。液压马达通过高（1：1）或低（1：4.3）传动比驱动。变速箱输出齿轮驱动套管动力钳齿轮箱体内的双联齿轮。然后双联齿轮的小齿轮带动一对隋轮驱动齿圈。通过换档手柄可以改变齿轮的传动比。

The complete tong gear train is shown in figure 3. The gear train consists of a shiftable two-speed gear box in a separate housing mounted on the tong top plate. The hydraulic motor drives a pinion directly through the high (1:1) or low (1:4.3) ratio of the gear box. The gear box output drives a pinion with the tong case. Through a cluster gear the input pinion drives a pair of rotary idlers which in turn drive the rotary gear. Shifting from high to low gear ratios is accomplished by lowering the shift lever handle.

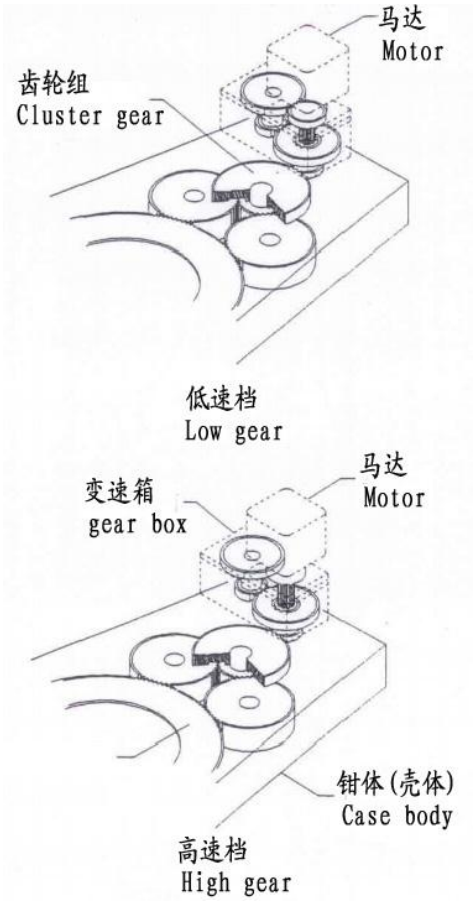

图 3 传动机构示意图

Figure 3 Schematic of drive train

3、颚板系统 Jaw System

液压套管钳颚板系统由三块颚板组成，两块前颚板，分别安装于大齿圈的两个较小的部分上，主颚板安装于大齿圈的较大部分上，在大齿圈、逆止销的共同作用下，三个颚板转动并作用于套管。

The power tong uses a three-jaw system consisting of two fixed jaws mounted on the smaller rotary gear segments and a master jaw mounted on the major segment. The jaws are rotated and actuated by the combined action of the rotary gear, permanent magnets or brake and reversing pin.

进行上扣操作时，先把钳头靠在需上扣的套管上，合上两个钳门，扣好锁闩，然后把逆止销置于上扣位置，操作操纵手柄向前推，颚板就会咬住管子并带动管子转动，把操纵手柄向后拉，则颚板松开，脱离套管。

During make-up operations, the pipe to be turned is first enclosed in the tong and the rotary door is closed and latched. Then, with the reversing pin in the make-up operations, the pipe to be turned is first enclosed in the tong and the rotary door is closed and latched. Then, with the reversing pin in the make-up position (as described later), the operator pushes the control lever forward to cause the jaws to bite and rotate the pipe. To release the jaws and back off from the pipe, the operator pulls the tong control lever outward.

卸扣时，将逆止销置于卸扣位置，操作操纵手柄向后拉，颚板便咬住套管并带动管子转动，把操纵手柄向前推，颚板松开，脱离套管。

During break-out operations, the reversing pin is placed in the break-out position so that

the jaws bite in the reverse direction. Then the operator pulls the tong control lever to cause the jaws to bite and break out the pipe. Finally, he pushes the lever forward to release the jaws and back them off the pipe.

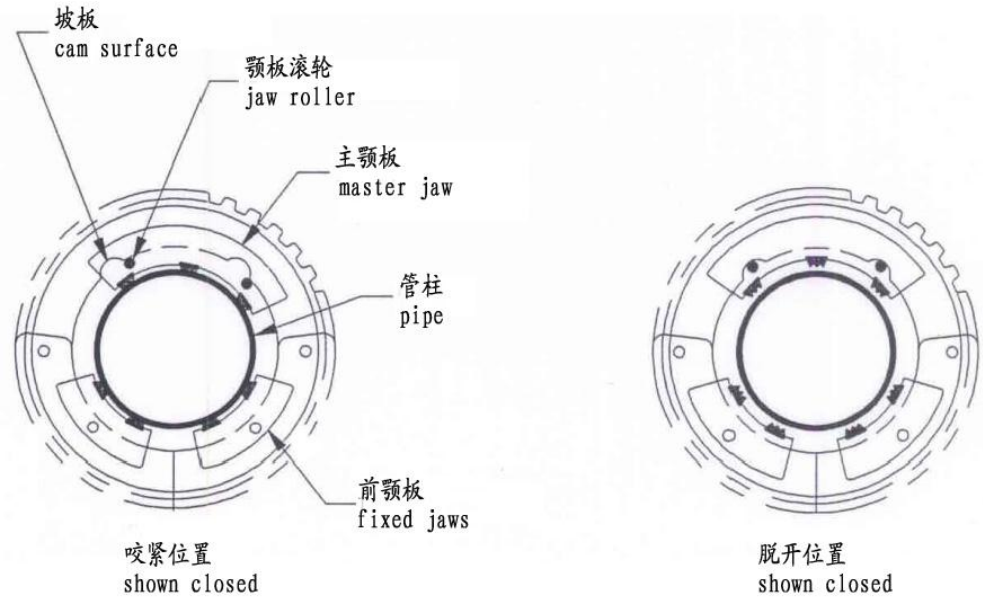

图 4 颚板工作示意图

Figure 4 Jaw action

如图 4 所示，当大齿圈旋转时，颚板滚轮沿大齿圈坡板的凹面滚上去，迫使颚板咬住管子，然后大齿圈继续转动，使管子接头上紧或卸开。

As illustrated in Figure 4, the jaw-biting action is a function of the rotary gear cam. When the rotary rotates, the jaw rollers roll up onto the cam surface and force the jaws to bite the pipe. Further rotation turns the pipe to make up or break out the joint.

4、液压动力站 Hydraulic Power

TQH340-35Y 套管动力钳由液压站提供动力。低速高扭矩工作时，液压站的输出要求是 17.5MPa（2500psi）、114lpm（30gpm）；高速运转时，液压站的输出要求是 227lpm（70gpm）、6.9MPa（1000psi）。为达到使用效果，液压站需要提供相应的输出功率。

The power tong is designed to be powered by a hydraulic power source capable of delivering 2500psi (175bar) and 30gpm (114lpm) for high-torque, low-speed operation. For high-speed operation the power source should develop 70gpm (227lpm) at pressures up to 1,000psi (69bar). A load-responsive power source should be used for optimum results.

液压站的输出压力 MPa (psi)与套管动力钳的最大输出扭矩有直接的关系。液压站的流量 lpm (gpm)关系到套管动力钳的运转速度。

Note that the pressure output (psi) of the power source is related directly to the maximum torque output of the tong. The power source flow output (gpm) is directly related to the output speed of the tong.

5、弹簧筒 Spring Hanger

根据用户要求可选配弹簧悬挂器，可使钳身在上（卸）扣时随接头螺纹旋入（出）的多少而上下移动。弹簧筒应直接连接在套管动力钳的提升架上。

The optional spring hanger permits the tong to move up or down to allow for thread length change in make-up and breakout operation. When used, the spring hanger should be attached directly to and used as a hanger for the tong.

6、扭矩仪 Torque Gauge Assembly

扭矩仪规格为 40KN.m，用来测量上（卸）扣时的扭矩，由拉力传感器、扭矩表及高压软管等组成，使用时注意背绳应与钳身成 90°，这样才能测得准确的扭矩。

The optional torque gauge assembly of 40 KN.m measures the torque exerted while the tong is used in make-up or breakout operations. Consisting of a hydraulic cylinder and torque meter connected by a pressure hose, the torque gauge assembly senses and indicates the torque developed during an operation. A backup line is connected to the cylinder and is tied off to a solid part of a rig structure to form an angle of 90 degrees to yield accurate torque readings.

四、安装 Installation

1、钳子空间要求 Tong Space Requirement

液压套管钳所需的空间尺寸见图 5

The space requirements of the power tong are shown in Figure 5.

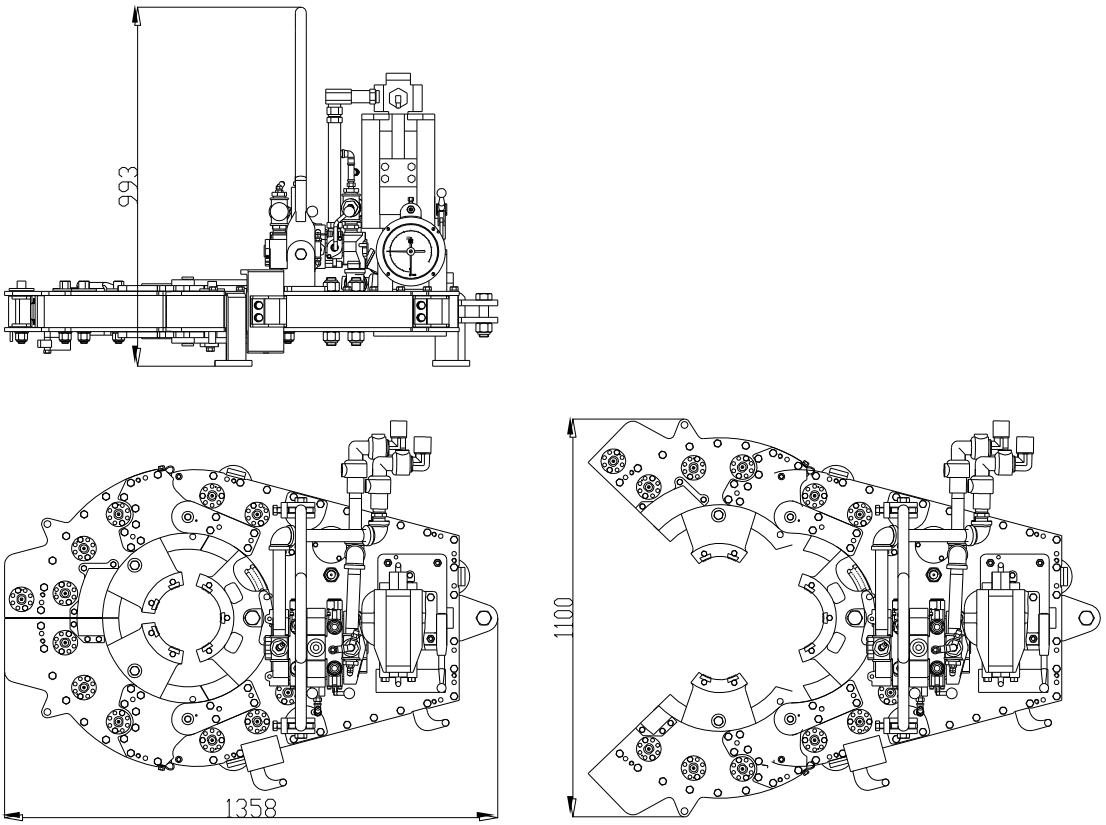

图 5 液压套管钳空间要求

Figure 5 Tong space requirements

2、悬吊 Hang The Tong

套管动力钳运到使用的井场，根据如下方法进行安装（见图 6）。

The tong is transported to the well site and hung into position as follows (See Figure 6).

将钢丝缆绳和套管动力钳衡梁连接，钢丝缆绳的另一端从井架二层台高的地方悬起套管动力钳，使得套管动力钳易被扶持和操作。悬挂的位置应尽量靠近转盘中心位置。

Connect cable to the tong bail. The tong should be suspended by a steel cable from a point high enough on the derrick to assure easy handling and maneuverability. The hang point should be positioned as near the center of the rotary gear as possible (allowing for hanger offset from

tong opening centerline) without interfering with movement of the casing handling tools.

警告：为确保安全，钢丝缆绳应至少能承受 1814kg（4000lbs）载荷。

WARNING: TO PREVENT BODILY INJURY THIS STEEL CABLE MUST BE RATED FOR 4,000 LBS (11814.4 kg) MINIMUM WORKING LOAD.

为确保套管动力钳能正常工作，套管动力钳工作时应保持水平。套管动力钳移至井口后，关闭钳门。套管动力钳前后水平的调节方法是调节提升架接触的螺栓，确保各螺栓都与提升架接触。套管动力钳左右水平的调节方法是使卸扣在提升架顶部的凹槽内移动至所需的位置。

The tong must be as near level as practicable for proper operation. When the tong is being leveled, the jaws should have been inserted and the doors closed. For fore and aft leveling, adjust the bolts at the hanger joint on each side of the case, assuring both bolts are in contact with the hanger strut. For side-to-side leveling, move the clevis in the notched insert at the top of the hanger to the required position.

尾绳和扭矩仪连接可防止套管动力钳绕管柱旋转，并能显示操作的扭矩。

Connect the backup line to the torque gauge to restrain tong rotation and to provide torque readings for operations.

警告：为了安全起见，井架和套管动力钳之间的尾绳的工作载荷能力应达到 11340kg（25,000lbs）以上。

WARNING: TO PREVENT SERIOUS BODILY INJURY SECURE TONG TO DERRICK WITH A BACKUP LINE RATED TO 25,000 POUNDS (11340 kg) MINIMUM WORKING LOAD.

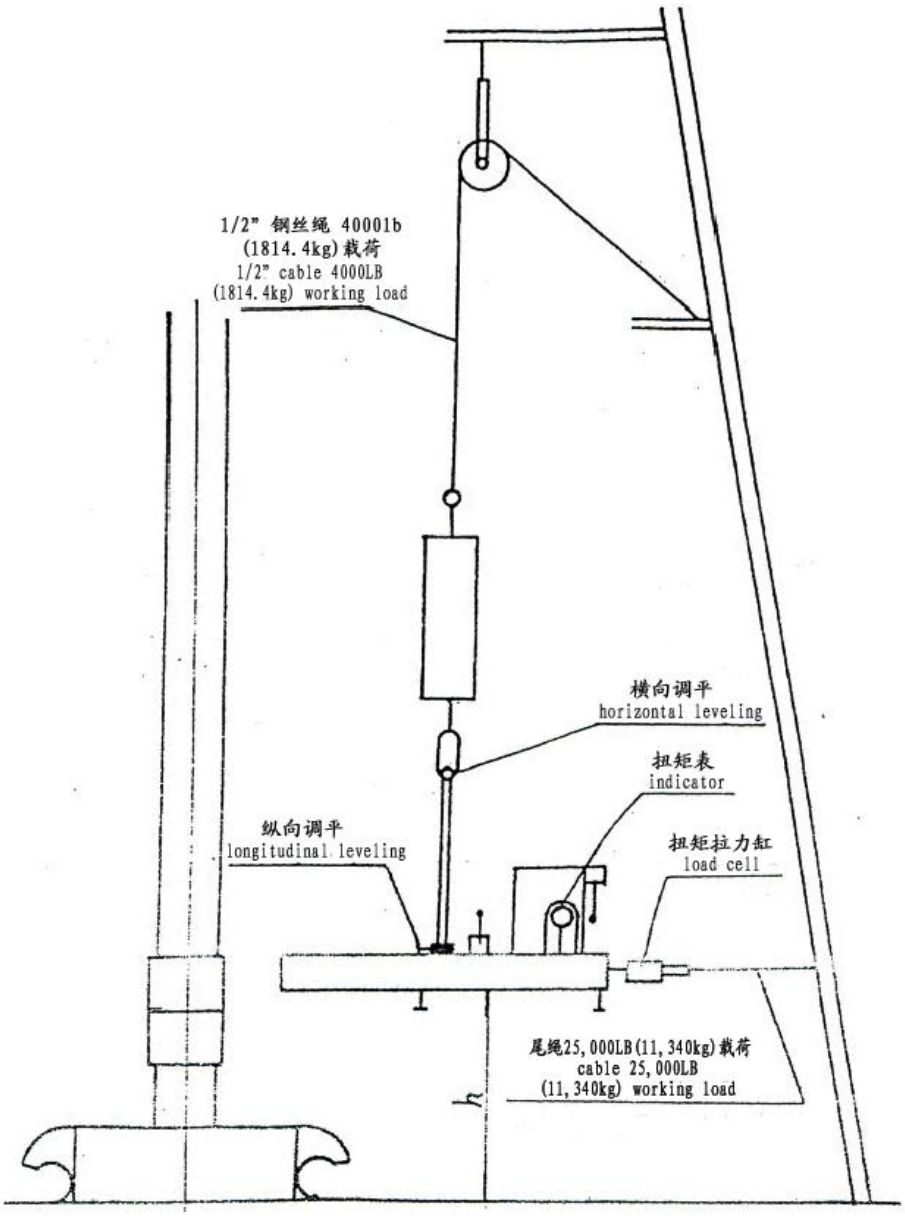

图 6 套管动力钳的安装示意图

Figure 6 Typical Installation of Power Tong

五、操作 Operation

1、操作说明 Operating Indicators

操作者在使用设备前必须非常熟悉设备的使用方法，操作前请按照我们推荐的方法调试和检查设备。

Before operating the unit, the operator should become thoroughly familiar with the operating controls and gauges. Then, before initial operation and daily thereafter, he should make the recommended adjustments and operational checks.

2、操作前的检查 Preoperating Checks

a. 检查确保所有必要的参数调整和各系统的正常运转；

After installing the system, check to be sure that all necessary adjustments are made and that the system is functioning correctly;

b. 在操作前，操作人员必须了解套管动力钳的正确操作方法和安全须知。确保所有管线正确连接和设备被正确牢靠吊起，颚板尺寸与管径一致；Before attempting operation, verify that operating personnel understand proper operation of the tong and the safety requirements. Ensure that all lines and equipment associated with hanging and securing the tong are of adequate size and in good condition.

c. 液压站输出压力要调整正确。根据液压站的操作手册设置所需要的输出液压。The power unit output pressure must be properly adjusted. Refer to the instruction manual on the power unit and perform the output pressure adjustment procedure for the required pressure.

3、操作时的检查 Operational Checkout

在使用前，请遵循以下操作并确保操作正确。液压套管动力钳被移送到井口工作位置后，关闭钳门，使套管动力钳保持水平；进、回油管线与液压站连接到位，然后进行以下检查工作：

Before starting a new job, perform the following operations and be sure the tong operates correctly. It is desirable to verify tong condition and operation before arriving at new job location. After the tong is transported to the job site, hoisted into operating position, leveled, connected to power unit and attached to back up line, proceed as follows:

a. 换档手柄和操纵手柄处于中间位置；

Be sure shifting lever and throttle handle are in neutral position.

b. 启动液压泵，使液压油在马达内循环流动直到液压油的温度达到操作温度为止。

Start the power unit and allow hydraulic fluid to circulate through the tong until fluid reaches operating temperature.

注意：这个过程与周围环境的温度有关。在寒冷的天气里，使用前可能需要操作系统几分钟预热设备。在温暖的天气里，简单的预热就可以了。

NOTE: This period will vary according to the ambient temperature. In severe weather conditions you may need to operate the system for several minutes before using the tong. In warm climates a brief warm-up period is adequate.

预热时，检查各连接部位确保无漏油现象，如有漏油，重新拧紧接头。

While the system warms up, check the connections to be sure that no leaks occur. Retighten connections if leaking.

c. 把逆止销拨至“上扣”位置。当管径大于 13.3/8”时，逆止销的位置应拨至相反方向。

Place the reversing pin in the hole on the rotary next to "make-up". For operation with pipe sizes larger than 13.3/8" diameter the position of the reversing pin is opposite that of other sizes.

注意：在颚板咬住管柱和扭矩产生前，大齿圈应先旋转运动离开中心位置 152.4mm（6in）远。如果门鼻销还没有离开门鼻销槽就产生了扭矩，大齿圈会被卡住而引发故障。当故障发生时，在咬紧管柱前将大齿圈反向旋转，这样可使大齿圈门鼻销总成向下压到门鼻销槽里。

NOTE: Rotary should move 6 inches (152.4 mm) away from its centered position before jaws grip the pipe and torque builds up. If torque is applied before the rotary plunger is out of the pocket, rotary lockup and subsequent case damage may occur. When breaking out, it may be necessary to counter rotate before gripping the pipe so that the rotary plunger is depressed and not up in the plunger pocket when applying torque

4、悬起动力钳，关闭钳门 Positioning Tong and Enclosing Casing

上述准备工作完成后，液压钳按下述方法吊起至适合的工作高度：

After performing the initial operations, position the tong for the make-up or breakout work to be done. Position the tong at the proper height for gripping casing as follows:

关闭钳门，检查锁闩是否与扣合器完全啮合，然后按下述方法操作动力钳。

Close the doors, observe that the latch is fully engaged over lug. Then operate the tong as follows.

警告：当打开钳门和使套管动力钳升至合适位置时请使用齿轮箱体上的把手，当钳体没有完全关闭时不能操作设备，否则可能会对设备造成严重的伤害。

WARNING: USE HANDLES PROVIDED WHEN OPENING DOOR AND POSITIONING THE TONG. DO NOT OPERATE TONGS WITHOUT DOOR GUARDS IN PLACE. SERIOUS PHYSICAL INJURY, INCLUDING LOSS OF FINGERS, COULD RESULT.

5、操作方法 Operating The Tong

a. 上扣：逆止销插入上扣位置，换档手柄调至高速档，马达选择阀手柄向左。

To complete the make-up operation, initially select high-speed operation by moving the shifting lever up and the motor selector to the left.

向前推动操纵手柄，顺时针转动大齿圈使颚板咬住套管开始上扣，直至套管转不动，将操纵手柄退回中间位置。

Push the throttle handle forward to begin turning the casing clockwise for make-up operation. Pull the throttle handle back to the neutral position when pipe stops rotating.

换挡手柄调至低速档位置

Select low-speed operation by moving the shifting lever down.

将操纵手柄推向前，观察扭矩表，等读数达到需要值时，松开操纵手柄退回中间位置。

Push the throttle handle forward. Observe the reading on the torque gauge. When proper torque is obtained, move the throttle handle in opposite direction to back off.

将操纵手柄向后拉，使颚板松开，待大齿圈门鼻销总成转至钳门中间位置（对缝处），打开钳门，将套管钳退出接头，完成上扣。

Center the plunger in pocket, open doors and pull tong away from joint.

b. 卸扣：逆止销插入卸扣位置，换档手柄调至低速档，马达选择阀手柄向左。

To complete the breakout operation, initially select low-speed operation by moving the shifting lever down and the motor selector to the left.

将操纵手柄向后拉，逆时针转动大齿圈使颚板咬住套管，缓慢拉动操纵手柄，注意观察扭矩表的读数，直至卸开套管接头，松开操纵手柄退回中间位置。

Push the throttle handle backward to begin turning the casing counterclockwise for breakout operation. Observe the reading on the torque gauge. Pull the throttle handle back to the neutral position when complete the breakout operation.

将换挡手柄向上推选择高速档运转。

Select high-speed operation by moving the shifting lever up.

将操纵手柄向后拉，继续卸扣，直至螺纹完全卸出，松开操纵手柄退回中间位置。

Push the throttle handle backward, breakout until completely remove the screw thread, then, move the throttle handle in opposite direction to back off.

将操纵阀手柄向前推，使颚板松开，待大齿圈门鼻销总成转至钳门中间（对缝处），打开钳门，将套管钳退出接头，完成卸扣。

Center the plunger in pocket, open doors and pull tong away from joint.

六、维护 Maintenance

设备的保养包括检查、润滑、测试和调整。按照“故障排查、修复、检验”的步骤维修设备，然后再测试。

Servicing the tong consists of inspection, lubrication, tests and adjustments. Should servicing reveal requirements for repairs, refer to the appropriate procedures in "Troubleshooting, Repair and Overhaul" and Testing".

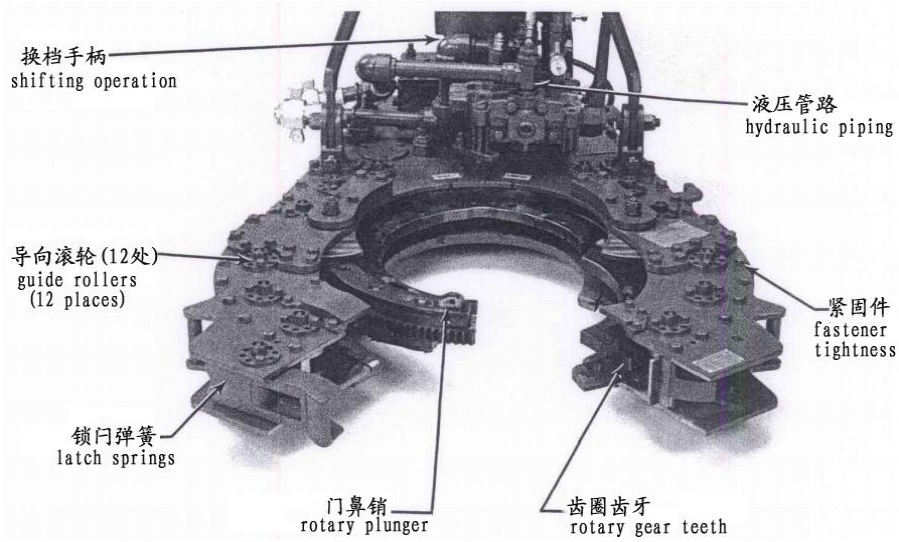

图 7 需要检查的部位

Figure 7 Inspection Points

1、日常检查 Daily Inspection

图 7 所示为日常保养中需要优先检查的部位。

Figure 7 illustrates the points that should be inspected prior to every job and once every operating day thereafter.

a、整套设备 Overall Equipment

检查整个设备及附属设备有无损坏，管道、马达、控制阀等部件是否有渗漏等。如有损坏或泄漏，则按大修程序予以排除和更换。

Inspect the unit and its accessories for obvious damage, evidence of hydraulic leaks at piping, motor and valve, etc. Refer to the overhaul procedures for removal and replacement of any faulty parts.

b、牙板 Jaw Dies

检查颚板钳牙有无损坏、折断或过度磨损，能否有效的咬住管柱，磨损严重须进行更换。

Inspect jaw dies to be sure that the biting edge is not worn excessively and is capable of biting effectively. Change the dies if necessary.

c、齿圈 Rotary Gear

检查大齿圈有无损坏、折断或过度磨损，如果相邻两个或更多的齿折断，则应更换，如果发现磨损严重或断齿，则应检查内部齿轮有无损坏，润滑脂内有无金属碎块。

Inspect gear teeth for excessive wear, damage or breakage. Replace if more than two adjacent teeth are broken. If excessive wear or breakage is found, inspect all internal gears and

grease packing for metal particles and damage.

d、锁闩弹簧 Latch Springs

检查锁闩弹簧是否有足够的力度，使钳门紧闭，必要时更换新的。

Springs must exert sufficient force to close latch firmly on the lug. Replace if necessary.

e、主颚板滚轮 Jaw Rollers

检查颚板滚轮能否转动灵活。定期在滚轮轴的顶部加油脂润滑。

Inspect jaw roller for free rotation. Lubricate roller through grease zert located atop jaw roller shaft.

2、每月检查 Monthly Maintenance

每个月做以下检查并采取适当的措施。

Once each month make the following checks and take appropriate corrective action.

a. 检查大齿圈导向滚轮的磨损情况，必要时更换。

Check rotary gear guide rollers for wear or breakage, and replace if necessary.

b. 检查主颚板滚轮的磨损情况，必要时更换。

Check jaw rollers for wear or breakage, and replace if necessary.

c. 检查换挡手柄、操纵手柄动作是否正常、操作灵活。

Check shifting operation and shifting shaft nuts to ensure they are secure.

d. 检查大齿圈和内部齿轮。

Inspect the rotary gear and internal gears.

e、检查门鼻插销是否有明显的磨损和损坏。

Examine the rotary plunger for evidence of wear or breakage.

f、检查齿轮箱内油位。

Check the oil level in the gear box.

g、检查扭矩系统传感器液缸的油量，受拉时，如果液缸（活塞）杆露出 1/2" (12.7mm) 或更多，则液面较低。

Check the torque gauge cylinder for low fluid volume. Fluid level is low if 1/2 inch or more of the cylinder rod is exposed when under tension.

h、检查所有紧固件是否有松动。

Check all fasteners for tightness.

3、润滑 Lubrication

良好的润滑对于套管动力钳的长期使用至关重要。

Proper lubrication is important to the operation and long life of the tong.

a、液压油的要求 Hydraulic fluid requirement

在正常操作时，应保持始终有液压油充满钳子内的液压回路，即使液压软管摘开后，仍应如此。

During normal operation, the tong should remain charged with hydraulic fluid, even when the hydraulic hoses are disconnected.

b、油嘴 Grease zerk

每次工作之前和每日工作之后，用黄油枪给每个黄油嘴添加润滑脂，润滑脂使用不应吝啬，如果过少会导致钳子过度磨损，图 8 显示了应润滑的点，表 2 详细说明了使用的润滑油（脂）的类型。

At the beginning of each job and once every operating day thereafter, use a grease gun to grease the 20/22 grease zerks. In general, be liberal with grease. Over-greasing will do no harm, where as greasing too little can result in excessive wear. Figure 8 shows the lubrication points.

请按以下方法润滑套管动力钳：

Grease the tong as follows:

(1) 在套管动力钳上部，润滑换挡轴。

On top of the tong, grease the shifting shaft.

(2) 润滑 3 个齿轮轴。

Grease the three gear bearings.

(3) 润滑所有导向滚子轴。

Grease all guide roller bearing zerks.

(4) 将门鼻销和与之接触的凹面涂满油脂。润滑铰链销。

Pack the rotary plunger and plunger pocket with grease. Liberally grease four door hinge pins.

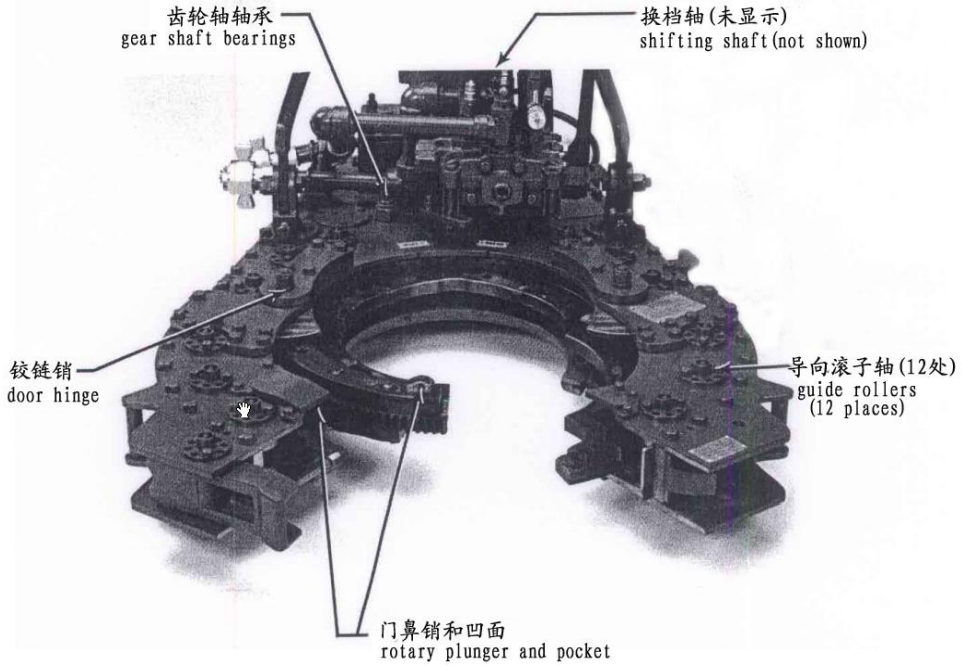

图 8 润滑点示意图

Figure 8 Lubrication Points

表 2 常用润滑油（脂）

Table 2 Recommended lubricants

润滑点各名称 Grease and oil	操作温度下使用的润滑油（脂）规格 Specifications at operating temperature	
	低于 5°F (-15°C)	高于 5°F (-15°C)
开口齿轮 Open gear lube	美孚 CM-L MOBIL CM-L	美孚 CM-P MOBIL CM-P
轴承 Bearing grease	美孚 SHC 220 MOBIL SHC 220	壳牌 ALVANIA 2 号，美孚 AW-2 SHELL ALVANIA NO.2, MOBIL AW-2
马达齿轮箱 Gear box oil	美孚 80W/90 MOBIL 80W/90	美孚 85/140 MOBIL 85/140

4、齿轮润滑 Gear Grease

根据图 8 和表 2 按以下过程润滑套管动力钳：

To pack the tong with grease, refer to Figure 8 and Table 2 and proceed as follows:

a、通过以下 2 个步骤使动力钳停止工作。
Disable the tong by both of the following methods.

(1) 断开马达动力源，换挡手柄和操纵手柄拨至中间位置；

Disconnect power from the power unit electrical motor, shift speed lever to neutral and set control lever to neutral.

(2) 断开套管动力钳与液压站的液压管线的连接。

Disconnect the hydraulic pressure line (1-inch line) from the tong at the hose connector.

b、将齿圈上涂满油脂。
Pack the unit with gear grease by liberally applying grease through the back rotary opening in case.

七、试车和调整 Test and Adjustment

1、锁闩调整 Door Latch Adjustment

每次调整导向滚轮之后，都要重新调整锁闩，锁闩绞链轴是偏心的可供调整，偏心的最大处用一箭头表示。

The latch hinge pin is an eccentric shaft providing adjustment. The high point of the eccentric is indicated by an arrow.

在大齿圈就位，调整导向滚轮使大齿圈居中，调整绞链轴使锁闩和扣合器达到图 9 所示的状态。对铰链轴调整后，安装 2 个螺栓和锁紧垫圈进行固定，同时旋紧轴底部的锁紧螺帽，调校后重复打开与关闭钳门数次进行检查，然后关闭钳门，推动任何一个钳门，锁闩应保持紧闭不松动。

With the rotary in place and guide rollers adjusted so that the rotary is centered, rotate the latch hinge pin to achieve the latch/lug alignment shown in Figure 9.After adjusting the latch hinge pin, install two bolts and lock washers to retrain adjustment, and tighten the lock nut on the bottom of the shaft. Following adjustment, recheck operation by operation by opening and closing the doors several times. With the doors closed and latched, pull on either door. The latch must not release.

注意：不正确的调校会导致套管钳工作时钳门松开，损坏大钳并造成人员伤害。

WARNING: FAILURE TO ADJUST PROPERLY CAN RESULT IN DOOR OPENING UNDER LOAD, DAMAGING THE TONG AND INJURING PERSONNEL.

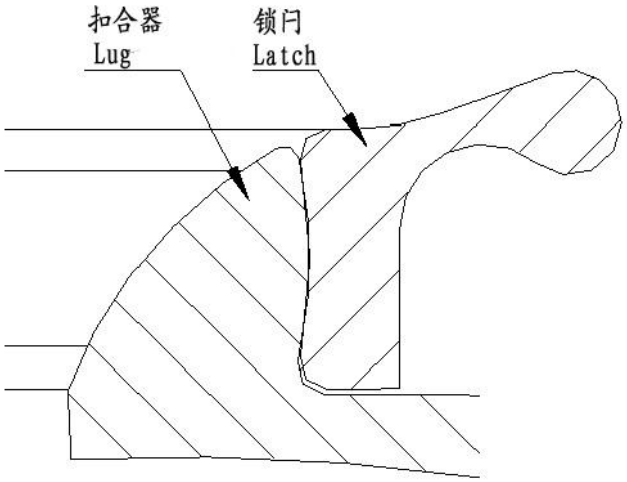

图 9 锁闩

Figure 9 Door latch

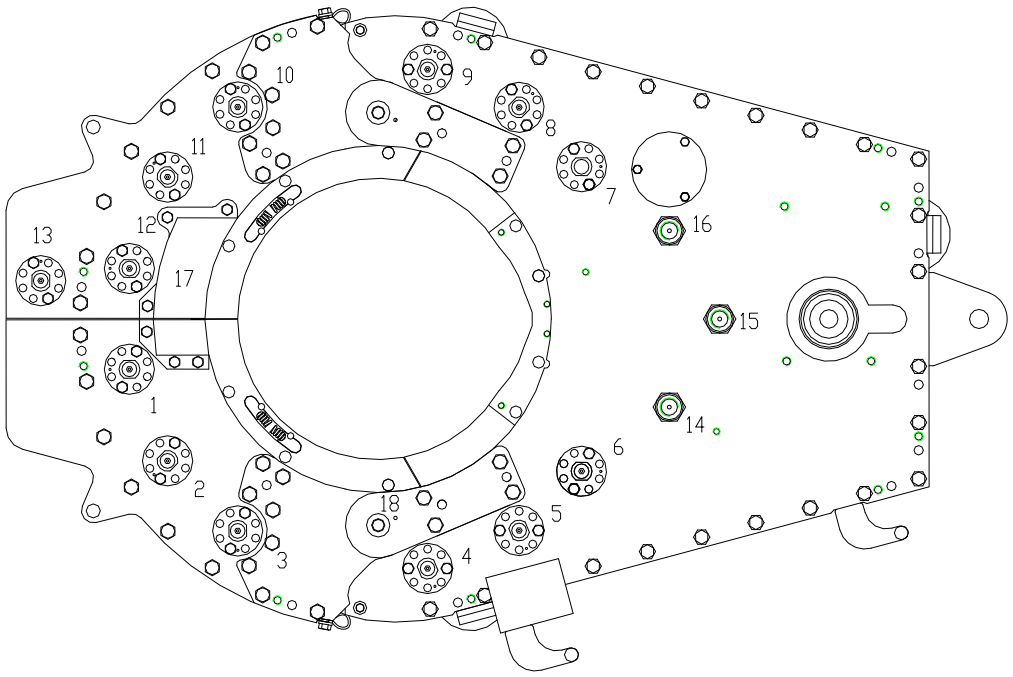

图 10 导向滚轮轴位置图

Figure 10 Guide Roller Shaft Positions

2、大齿圈对中调整 Rotary Centering Adjustment

卸下大齿圈，松开偏心轴底部锁紧螺帽，卸下偏心轴法兰面上的螺栓和锁紧垫圈（参见图 10）。

With the rotary removed and referring to Figure 10, loosen lock nuts on the shafts at points 1 through 6 and 9 through 14. Remove the bolts and lock washers from the Shafts.

转动各个导向滚轮偏心轴，使轴法兰面上的箭头均沿大齿圈半径方向位于最外位置。

Position the shafts with the high-point arrow located radially away from the rotary center.

装上大齿圈，合上并锁紧钳门，然后调整锁闩铰链轴直至锁闩与扣合器完全吻合，并用螺栓和弹簧垫圈将铰链轴固定及旋紧底部的螺帽。

Install the rotary assembly and close and latch the doors. Then adjust latch pin until tight on cam and secure shaft in place (to nearest full bolt hole) with bolts and lock washers.

警告：检查齿轮啮合情况，啮合不良可能引起断齿。

WARNING: ALWAYS CHECK FOR GEAR MESH. IMPROPER MESHING OF GEARS CAN RESULT IN TOOTH BREAKAGE.

a、通过位置 1、4、9 和 12 处的轴，使滚轮与大齿圈全部接触；

Use shafts at positions l, 4, 9 and 12 to position the rotary.

b、逆时针旋转轴 1 直至齿圈与隋轮啮合；

Rotate shaft 1 counterclockwise until rotary teeth mesh with idler gears.

c、逆时针旋转轴 4，转 1/4 圈，然后顺时针将轴 9 转动 1/4 圈。反复调整轴 4 和轴 9 直至大齿圈啮合良好，并使两轴上的箭头处于对称位置；

Rotate shaft 4 counterclockwise 1/4 turn and then rotate shaft 9 clockwise l/4 turn. Repeat adjustment on shafts 4 and 9 until rotary is snug and positions of high point arrows on these shafts are in approximately the same position in relation to the case opening.

d、逆时针转动轴 1 ，顺时针转动轴 12 ，两者同时转动，直至齿圈啮合均匀，且两轴端的箭头相对于钳子壳体处于对称位置；

Rotate shaft 1 counterclockwise and shaft 12 clockwise simultaneously until rotary is snug and positions of high point arrows on these shafts are in approximately the same position in relation to the case opening.

e、逆时针转动 2 、3 、5 和 6 ，直到这些轴上的滚轮与齿圈轻轻接触；

Rotate shafts 2, 3, 5 and 6 counterclockwise until guide rollers 1ightly touch rotary.

f、同样，顺时针转动 7 、8 、10 和 11 ，直到各轴上的滚轮与齿圈轻轻接触；

Rotate shafts 7, 8, 10 and 11 clockwise until guide rollers lightly touch rotary.

g、当各导向滚轮与大齿圈接触后，箭头相对于壳体的位置要大致相同，必要时需重新调整；

When the guide rollers are snugged up, the high point arrow should be in approximately the same position in relation to the case opening. Readjust to obtain this relationship if necessary.

h、按如下调整滚轮轴：

Secure case shafts as follows:

如果轴肩上任何 2 个孔与 4、5、6、7、8 和 9 对应的上盖板上的内螺纹孔对齐，顺时针旋转轴 4、5、6，使偏离轴肩孔 1/4-1/2，逆时针旋转轴 7、8、9 ，使偏离轴肩孔 1/4-1/2。

用尖锐物体穿过导向滚轮轴衬垫，使与上盖板上内螺纹孔完全对准的 2 个相对的轴肩孔位置对齐。

调整后，用螺栓和垫圈拧紧轴 4、5、6、7、8 和 9。

If any two holes in the shaft shoulders align with tapped holes in top plate for shafts 4, 5, 6, 7, 8 and 9, rotate shafts 4, 5 and 6 clockwise and rotate shafts 7, 8 and 9 counterclockwise 1/4 to 1/2 shaft shoulder hole. At this point, two opposing shaft shoulder holes should align with two tapped holes in the top plate. (A sharp object is required to align shaft shoulder holes with two of the four tapped holes in the top plate for each shaft.)

After adjustment, secure shafts 4, 5, 6, 7, 8 and 9 with bolts and lock washers.

i、按如下调整钳门轴：

Secure door shafts as follows:

按照上述 h 的方法顺时针调节轴 1、2、3，逆时针调节轴 10、11、12。调整好后在轴 1、2、3、10、11、12 上拧好螺栓；

Follow procedures in paragraphs 8, adjusting shafts l, 2 and 3 clockwise and shafts 10, 11 and 12 counterclockwise. After adjustment, secure shaft 1, 2, 3, 10, 11 and 12 with bolts and lock washers.

j、根据钳门锁闩调整方法松开钳门锁闩轴；

Loosen door latch shaft and adjust according to door latch adjustment procedure.

k、打开钳门，拆下齿圈。用手旋转每个滚轮，检查滚轮上下间隙。滚轮旋转时用力应大小一致。垂直间隙应大于 0.25mm，小于 1.27mm，可用螺母调整；

Open doors and remove rotary. Rotate each roller by hand and check vertical play of rollers. Rollers should rotate with a light uniform drag. Vertical clearance (end play) must be no less than 0.010 inches and no more than 0.050 inches. Adjust with the lock nut.

l、重复润滑齿轮和滚轮并重新安装齿圈。检查齿牙啮合，然后拧上限制齿圈位移的

限位螺栓；

Lubricate gears and rollers liberally and reinstall rotary. Check tooth engagement. Install rotary retaining bolts.

m、重新检查锁闩。

Following adjustment, recheck the door latch adjustment.

3、换挡手柄的调整 Shifting Locator Pin Adjustment

把换挡手柄升到高速档位置，弄清控制拨叉是否在合适位置，对手柄加相当大的力，手柄应仍处于高档位置，再加大力量，则手柄应自由地滑向另一档位置。在空挡和低档重复这样的操作检查。

To check the operation of the shift locator pin, raise the shifting handle to the high-speed position and verify the control snaps into position. Exert force on the shifting lever and verify that the lever remains in the high-speed position until considerable force is exerted, when it will give way to slide freely to the next position. Repeat this operational check in the low-speed and neutral positions.

如果通过检查，发现换挡手柄过松，则将定位销上紧半圈，然后重复检查调整，直至操作良好。

When an operational check indicates the need to adjust the shifting locator pin, adjust by tightening the spring plunger body one-half turn. Repeat the locator pin operational check. If additional adjustment is indicated, repeat the adjustment procedure until proper operation is achieved.

八、常见故障及修理 Troubleshooting and Repair

1、故障诊断及解决方法 Troubleshooting and Repair

表 3 故障排查及解决方法

故障	可能原因	解决方法
钳头打滑	1.颚板尺寸与套管尺寸不符； 2.颚板滚轮尺寸不对； 3.牙板磨损。	1.安装正确的颚板； 2.更换滚轮 3.清洗或更换牙板。
颚板滚轮爬到头后仍夹不到套管	1.管径太小； 2.套管动力钳与管柱不垂直。	1.安装外径增大 1/16in 的滚轮； 2.调整平衡梁直至钳身水平。
颚板不爬坡	1.弧形磁铁磁力不够； 2.套管动力钳与管柱不垂直。 3.管径太大。	1.更换弧形磁铁； 2.调整平衡梁直至钳身水平； 3.安装较小尺寸的滚轮（直径减小 1/16in）。
扭矩不够	1.液压站压力太低或油泵排量不足； 2.液压站设置正确，但减压阀没有调节好； 3.减压阀卡住了； 4.减压阀渗漏； 5.控制阀或马达故障；	1.根据液压站的操作手册调试正确； 2.顺时针调节减压阀直至设置正确； 3.检查清洗阀体，检查弹簧，检查液压油是否清洁； 4.检查阀座和油是否有杂质； 5.维修或更换； 6.检查管接头和管线。

	6.液压管路不畅通。	
马达运转但是颚板不转	1.换挡机构故障； 2.齿轮损坏。	1.检查和修复换挡装置； 2.检查和更换损坏的齿轮。
马达不转	联锁阀(如果有安装)故障	检查阀体脏污和柱塞堵塞
钳头旋转太慢	1.液压油流量太低； 2.储油太少； 3.马达磨损。	1.检查液压站； 2.检查油面高度； 3.检查马达。
钳头无力，轻载时停转	导向滚轮或从动齿轮轴承磨损严重或损坏	更换导向滚轮或轴承
控制阀手柄处于中位时钳头旋转	控制阀故障	更换控制阀
换挡手柄不能保持停留在高档位	1.定位销调整不当； 2.变速杆上的槽严重磨损； 3.马达轴磨损。	1.调整定位销； 2.更换定位销总成及变速杆； 3.更换马达。
马达渗油	轴密封圈失效	更换密封圈
齿轮箱漏油	轴密封或垫圈损坏	更换轴密封或垫圈
密封长期出问题	阀体排油孔堵塞	断开接头并清洗
钳门打不开	1.齿圈位置不对； 2.门鼻插销故障； 3.导向滚轮调整不当。	1.逆止销调整到正确的地方； 2.清洗、注油并检查是否有阻滞不光滑之处； 3.调整导向滚轮轴。
当上卸扣时，大齿圈卡死	当门鼻销在钳身壳体的凹槽内时便施加了扭矩，或由于扭矩施加的过急促，门鼻销来不及压缩	如果可能倒转大齿圈，使门鼻销退回凹槽内（前部中间位置），如果大齿圈仍然卡死，则按下述方法把钳子从管子上卸下。从两扇钳门底部卸下固定螺栓，拉开钳门，注意使大齿圈关闭，在颚板间插入一个撬杠，用力使钳门顶板打开，离开门鼻销，打开钳门

Table 3 Troubleshooting

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Tong fails to grip	1. Wrong size of jaws in tong 2. wrong size of rollers 3. Dies fail to grip	1. Install correct jaw 2. Replace correct rollers. 3. Clean or replace dies.
Jaws come out of neutral cam but will not penetrate pipe	1. Undersized pipe 2. Tong not hanging perpendicular to pipe	1. Install oversize rollers (1/16-inch OD larger) 2. Adjust bail until tong hangs level.
Jaws do not come out of neutral cam	1. Magnets not strong enough 2. Tong not hanging perpendicular to pipe. 3. Oversized pipe	1. Replace 2. Adjust bail until tong hangs level. 3. Install undersized rollers (1/16-inch OD smaller)

Tong does not develop sufficient torque	1. Power unit pressure not set high enough 2. Power unit properly set, but relief valve on tong not set high enough 3. Relief valve stuck 4. Relief valve leaking 5. Faulty tong valve or motor 6. Faulty torque gauge 7. Restriction in hydraulic lines to power unit	1. Refer to instruction manual on power unit. 2. With pressure gauge in the relief valve "gauge port," stall tong and turn valve relief screw adjustment clockwise until pressure is set correctly. 3. Check and clean valve. Check valve spring. Check hydraulic fluid for cleanliness. 4. Check valve seats and oil for contaminants. 5. Repair or replace valve or motor. 6. Repair or replace torque gauge. Check fluid level. 7. Check hydraulic connections and lines for restrictions and obstructions. Tighten quick connectors.
Motor runs but tong does not rotate	1. Faulty shifting mechanism 2. Broken gear	1. Check shifting mechanism and repair as necessary 2. Check for broken gear and replace as necessary
Motor does not turn	Faulty interlock valve (if equipped)	Check for obstructions of plunger and for contamination in valve
Tong rotates slowly	1. Power unit flow rate too low 2. Reservoir oil level low 3. Tong motor wear	1. Check power unit 2. Check oil level 3. Check motor
Tong hangs up under light load	Excessively worn or broken guide roller or idler gear bearing	Replace guide roller or idler gear bearing
Tong rotates when control lever is in neutral	Faulty control valve	Replace control valve
Shifting lever will not remain in high-speed position	1. Locator pin improperly adjusted 2. Groove warn in shifting shaft (by locator pin) 3. Worn motor shaft	1. Adjust locator pin. 2. Replace locator pin assembly. 3. Replace motor.
Motor leaks	Faulty shaft seal	Replace motor seal
Oil leaks from gear box	Blown shaft seal or gasket	Replace seals or gasket
Seal presents chronic problem	Plugged case drain	Disconnect end of case drain connected to valve shafts and clear line
Tong doors fail	1. Rotary is not in	1. Align reversing pin with proper arrow.

to open	proper position 2. Rotary plunger not functioning properly 3. Improperly adjusted guide rollers	2. Clean, regrease and check for a point of interference. 3. Adjust guide roller.
Rotary jams when making or breaking casing	Rotary plunger in pocket when torque was applied, or torque was applied too rapidly, not allowing plunger to depress	If possible, back up rotary until rotary plunger is in pocket (center front position). Operate per tong hanging instructions in "Installation." If rotary remains jammed, remove tong from pipe as follows: Remove retainer bolt from bottom of each door. Pull open door (opposite door with jammed plunger), taking care to keep rotary closed. Placing a pry bar in space between jaws, force top door plate open and off jammed plunger, and open door.

九、 动力钳的拆卸及零件明细 Disassembly and Parts

本钳子不需任何特殊工具，仅用普通工具便可拆卸，拆装之前要先熟悉结构和零件名称，以避免损坏，不要做不必要的拆卸。

The tong is designed for assembly/disassembly using normally available mechanics' tools. No special tools are required. As with any piece of equipment, the mechanic must familiarize himself with the equipment and nomenclature to avoid improper assembly and damage to the tong. Do not disassemble the tong or subassembly further than necessary to accomplish the required maintenance.

注意：拆卸前一定要断开动力钳和液压动力站的连接。

WARNING: DO NOT ATTEMPT TO PERFORM ANY ADJUSTMENT, REPAIR OR DISASSEMBLY WITH THE TONG CONNECTED TO A POWER SOURCE.

本钳子由以下几大部件组成：

The power tong has been separated into several major subassemblies as listed below:

大齿圈总成 Rotary Assembly
壳体总成 Case Assembly
钳门总成 Door Assemblies
齿轮箱总成 Gear Box Assembly
马达总成 Motor Assembly
管汇总成 Manifold Assembly
液压总成 Hydraulic Assembly
控制阀总成 Control Valve Assembly
颚板总成 Jaw Assembly
提升总成 Lift Assembly
扭矩仪 Torque Gauge

以下部件可以在不拆卸壳体的情况下卸下来：

The following items can be removed without disassembly of the case:

大齿圈总成 Rotary Assembly
钳门总成 Door Assemblies

齿轮箱总成 Gear Box Assembly
马达总成 Motor Assembly
管汇总成 Manifold Assembly
钳门铰链轴承 Door Hinge Bearings
导向滚轮 Guide Rollers
主驱动齿轮轴及轴承 Main Drive Pinion Shaft Cup and Bearing

1、大齿圈拆卸及零部件明细表 Rotary Assembly, Disassembly and Parts

从钳体底部取下 3 个大齿圈固定螺栓。将钳子置于一个平坦不倾斜的位置，避免钳门打开时大齿圈向前滑动，将钳门完全打开，系上吊索，将大齿圈柱销固定在压下位置（以免大齿圈打开），将大齿圈向前由壳体内滑出，然后放置于垫块之上，使齿圈底部暴露出来（见图 11）。

Remove the three rotary retainer bolts from the underside of the case and doors. Place the tong on a flat surface, where it cannot tilt forward when doors are open and the rotary slides forward (see Figure 11).

注意：不要进一步拆卸大齿圈，否则会引起损坏钳子零部件的结果。

WARNING: DO NOT ALLOW DOORS TO OPEN AS ROTARY MAY SLIDE OUT IF CASE IS TILTED WHILE BEING POSITIONED.

卸下固定螺栓及弹簧垫圈后，可卸下门鼻销总成，根据需要替换门鼻销总成。

Plunger assembly is removable by removing retaining bolt and lockwasher. Replace the assembly as required.

从底部取下保持螺栓,然后就可卸下坡板。弹簧座通过铆钉连接不需要拆卸。

Spring blocks are attached by rivets and should not require removal.

衬套可以用一圆棒压出来，更换时，使用一个螺栓将衬套拉入大齿圈就位。衬套在靠近大齿圈一端有一个固定螺栓。

Bushings can be removed by pressing out with a drift pin. When replacing bushings, apply loctite stud lock to outer surface and press in place. Bushing has a set screw in the rotary end.

注意：拆卸到以上状态后，建议不要做进一步的拆卸和维修。

WARNING: NO FURTHER DISASSEMBLY OR REPAIR IS RECOMMEDED.

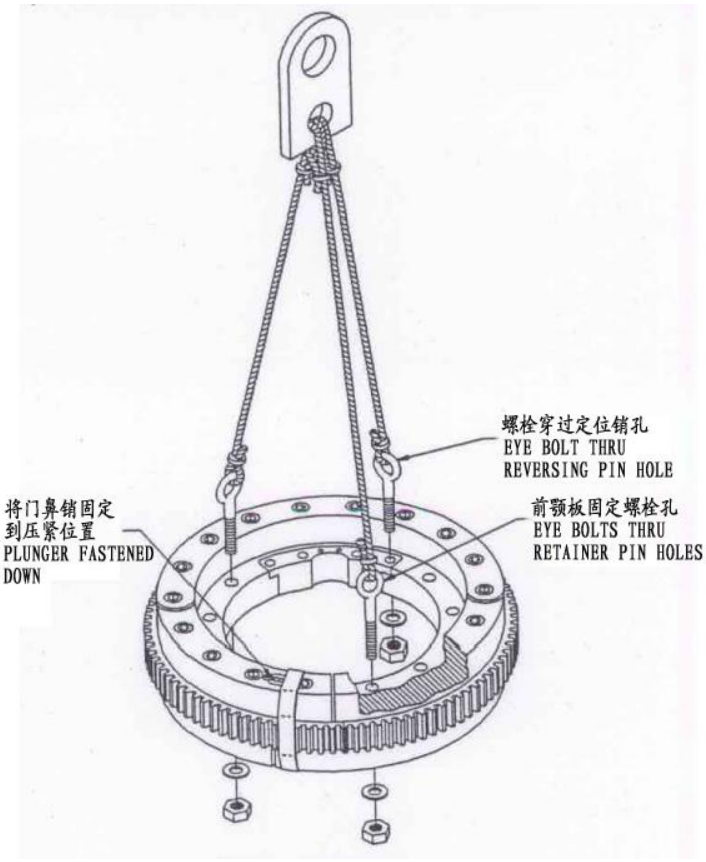

图 11 大齿圈提升示意图

Figure 11 Preferred method of lifting rotary

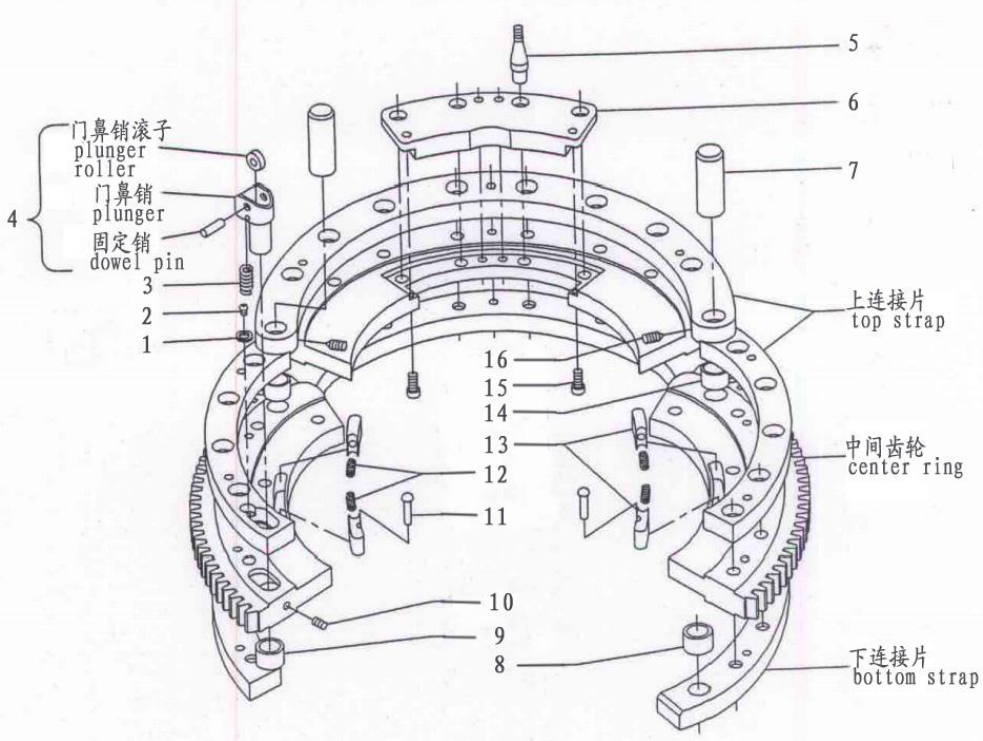

图 12 13.3/8 大齿圈总成

Figure 12 13.3/8 Rotary assembly

表 4　13.3/8”大齿圈总成（对应图 12）

Table 4　Parts of 13.3/8” Rotary Assembly (see Figure 12)

序号 No.	名称 Name	数量（13.3/8 齿圈） Qty. (13.3/8 Rotary Assembly)
1	垫圈 Washer, lock	1
2	圆头螺钉 Capscrew, button hd.	1
3	门鼻销弹簧 Spring, plunger	1
4	门鼻销总成 Plunger assembly	1
5	逆止销 Reversing pin	1
6	13.3/8”坡板 Cam insert, 13.3/8 rotary	1
7	大齿圈铰链销 Pin, rotary hinge	2
8	门鼻销衬套 Bushing, rotary plunger	1
9	门鼻销衬套 Bushing, rotary plunger	1
10	固定螺钉 Setscrew	1
11	平头铆钉 Rivet, flat hd.	4
12	限位弹簧 Spring, rotary block	4
13	弹簧座 Block spring	4
14	大齿圈铰链套 Bushing, rotary hinge	2
15	内六角螺丝 Capscrew, socket hd.	2
16	固定螺丝 Set screw	2

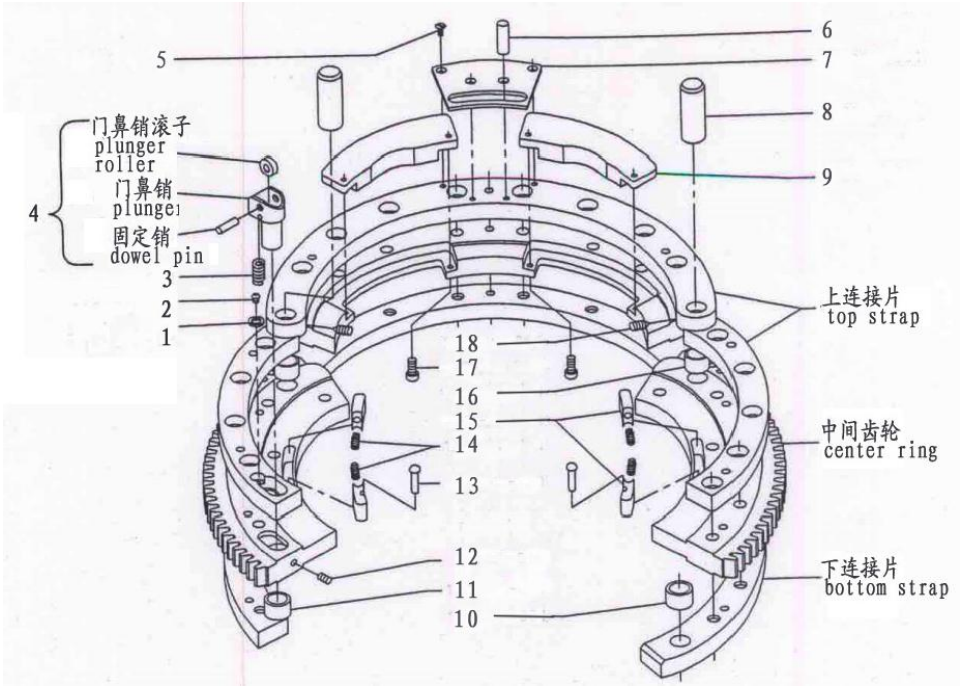

图 13　16”大齿圈总成

Figure 13　16” Rotary assembly

表 5　16”大齿圈总成（对应图 13）

Table 5　Parts of 16” Rotary Assembly (see Figure 13)

序号 No.	名称 Name	数量（16”齿圈） Qty. (16” Rotary Assembly)
1	垫圈 Washer, lock	1
2	圆头螺钉 Capscrew, button hd.	1
3	门鼻销弹簧 Spring, plunger	1
4	门鼻销总成 Plunger assembly	1
5	沉头螺钉 Capscrew, flat hd.	4
6	逆止销 Reversing pin	1
7	逆止销板 Reversing pin plate	1
8	16”坡板 Cam insert, 16” rotary	1
9	大齿圈铰链销 Pin, rotary hinge	2
10	门鼻销衬套 Bushing, rotary plunger	1
11	门鼻销衬套 Bushing, rotary plunger	1
12	固定螺钉 Setscrew	1
13	平头铆钉 Rivet, flat hd.	4
14	限位弹簧 Spring, rotary block	4
15	弹簧座 Block spring	4
16	大齿圈铰链套 Bushing, rotary hinge	2
17	内六角螺丝 Capscrew, socket hd.	2
18	固定螺丝 Set screw	2

2、颚板总成和零部件明细表 Jaw Assembly and Parts

根据所要操作的管子尺寸，对颚板的安装要求有所不同，图 14~15 及表 6~7 提供了颚板的安装指南和部件清单。

Jaw installation requirements vary according to the size of pipe to be griped. Standard jaw sizes available are listed in Figure14 through 15 and Table 6 through 7.

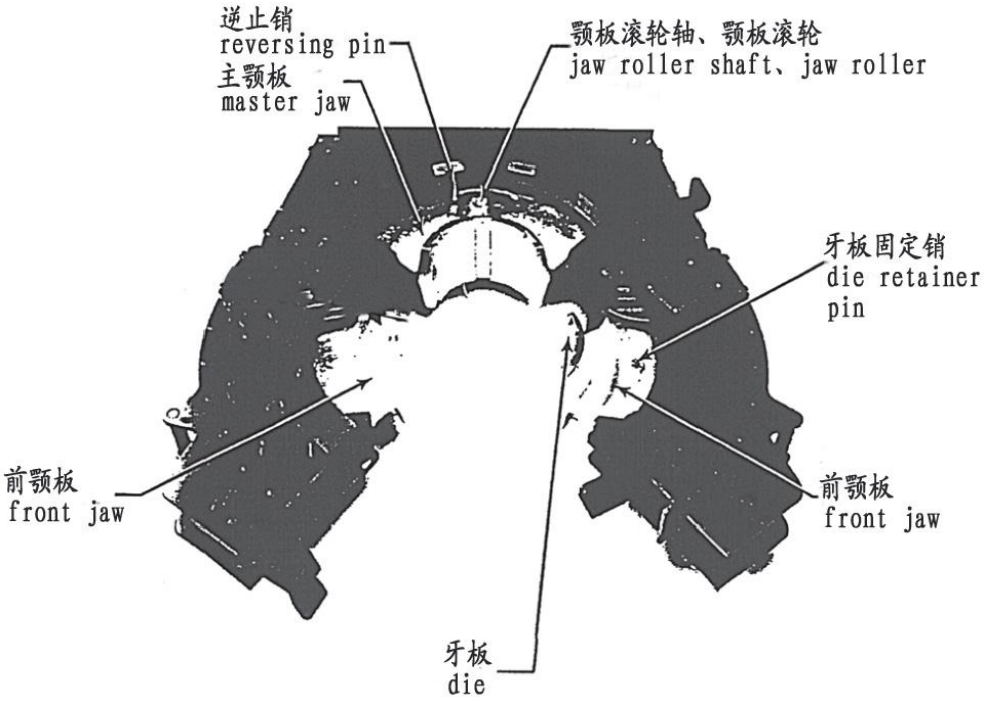

图 14　6.5/8”~13.3/8”颚板总成

Figure 14　6.5/8”~13.3/8” Jaw assembly

注意：在液压动力源接通钳子时，不要试图更换颚板，需更换时，卸下 1”管线接头，并关闭动力系统。

WARNING: DO NOT ATTEMPT TO REMOVE OR INSTALL JAWS WITH POWER CONNECTED TO THE TONG. DISCONNECT THE I-INCH HOSE AND TURN POWER UNIT OFF PRIOR TO REPLACING JAWS.

表 6　6.5/8”~13.3/8”颚板零件表

Table 6　Parts for 6.5/8” through 13.3/8” jaws for use in 13.3/8” rotary

管径 Pipe size (in)	序号 No.	名称 Description	每套钳所需数量 Req’d No per jaw set	每套主颚板所需数量 Req’d No per master jaw	每套前颚板所需数量 Req’d No per front jaw
6.5/8	1	6.5/8”颚板总成 6.5/8” Jaw set	X		
	2	6.5/8”主颚板总成 6.5/8” Master jaw assembly	1	X	
	3	6.5/8”前颚板总成 6.5/8” Front jaw assembly	2	-	X
	4	6.5/8”主颚板 Jaw 6.5/8”master	1	1	-
	5	6.5/8”前颚板 Jaw 6.5/8” front	2	-	1
	6	颚板滚轮轴 Jaw roller shaft	1	1	-
	7	颚板滚轮 Jaw roller	1	1	-
	8	牙板固定销 Die retainer pin	14	6	4
	9	锁紧垫圈 Lockwasher	1	1	-
	10	油嘴 Lube fitting	1	1	-
	11	牙板(16401-2) die	7	3	2

	12	颚板固定螺栓 Jaw retainer bolt	2	-	1
7	1	7”颚板总成 7” Jaw set	X		
	2	7”主颚板总成 7” Master jaw assembly	1	X	
	3	7”前颚板总成 7” Front jaw assembly	2	-	X
	4	7”主颚板 Jaw 7” master	1	1	-
	5	7”前颚板 Jaw 7” front	2	-	1
	6	颚板滚轮轴 Jaw roller shaft	1	1	-
	7	颚板滚轮 Jaw roller	1	1	-
	8	牙板固定销 Die retainer pin	14	6	4
	9	锁紧垫圈 Lockwasher	1	1	-
	10	油嘴 Lube fitting	1	1	-
	11	牙板(16401-2) die	7	3	2
	12	颚板固定螺栓 Jaw retainer bolt	2	-	1
7.5/8	1	7.5/8”颚板总成 7.5/8” Jaw set	X		
	2	7.5/8”主颚板总成 7.5/8” Master jaw assembly	1	X	
	3	7.5/8”前颚板总成 7.5/8” Front jaw assembly	2	-	X
	4	7.5/8”主颚板 Jaw 7.5/8”master	1	1	-
	5	7.5/8”前颚板 Jaw 7.5/8” front	2	-	1
	6	颚板滚轮轴 Jaw roller shaft	1	1	-
	7	颚板滚轮 Jaw roller	1	1	-
	8	牙板固定销 Die retainer pin	14	6	4
	9	锁紧垫圈 Lockwasher	1	1	-
	10	油嘴 Lube fitting	1	1	-
	11	牙板 16401-2 die	7	3	2
	12	颚板固定螺栓 Jaw retainer bolt	2	-	1
8.5/8	1	8.5/8”颚板总成 8.5/8” Jaw set	X		
	2	8.5/8”主颚板总成 8.5/8” Master jaw assembly	1	X	
	3	8.5/8”前颚板总成 8.5/8” Front jaw assembly	2	-	X
	4	8.5/8”主颚板 Jaw 8.5/8”master	1	1	-
	5	8.5/8”前颚板 Jaw 8.5/8” front	2	-	1
	6	颚板滚轮轴 Jaw roller shaft	1	1	-
	7	颚板滚轮 Jaw roller	1	1	-
	8	牙板固定销 Die retainer pin	14	6	4
	9	锁紧垫圈 Lockwasher	1	1	-
	10	油嘴 Lube fitting	1	1	-
	11	牙板(16401-2) die	7	3	2
	12	颚板固定螺栓 Jaw retainer bolt	2	-	1

9.5/8	1	9.5/8”颚板总成 9.5/8” Jaw set	X		
	2	9.5/8”主颚板总成 9.5/8” Master jaw assembly	1	X	
	3	9.5/8”前颚板总成 9.5/8” Front jaw assembly	2	-	X
	4	9.5/8”主颚板 Jaw 9.5/8”master	1	1	-
	5	9.5/8”前颚板 Jaw 9.5/8” front	2	-	1
	6	颚板滚轮轴 Jaw roller shaft	1	1	-
	7	颚板滚轮 Jaw roller	1	1	-
	8	牙板固定销 Die retainer pin	14	6	4
	9	锁紧垫圈 Lockwasher	1	1	-
	10	油嘴 Lube fitting	1	1	-
	11	牙板(16401-2) die	7	3	2
	12	颚板固定螺栓 Jaw retainer bolt	2	-	1
10.3/4	1	10.3/4”颚板总成 10.3/4” Jaw set	X		
	2	10.3/4”主颚板总成 10.3/4” Master jaw assembly	1	X	
	3	10.3/4”前颚板总成 10.3/4” Front jaw assembly	2	-	X
	4	10.3/4”主颚板 Jaw 10.3/4” master	1	1	-
	5	10.3/4”前颚板 Jaw 10.3/4” front	2	-	1
	6	颚板滚轮轴 Jaw roller shaft	1	1	-
	7	颚板滚轮 Jaw roller	1	1	-
	8	平头螺丝 1/4” Capscrew 1/4”-20×1/2”	12	4	4
	9	垫圈 Washer 1/4”	12	4	4
	10	锁紧垫圈 Lockwasher	1	1	-
	11	油嘴 Lube fitting	1	1	-
	12	牙板（24768-2） die	4	4	-
	13	牙板Ⅰ dieⅠ	4	-	2
	14	颚板固定螺栓 Jaw retainer bolt	2	-	1
11.3/4	1	11.3/4”颚板总成 11.3/4” Jaw set	X		
	2	11.3/4”主颚板总成 11.3/4” Master jaw assembly	1	X	
	3	11.3/4”前颚板总成 11.3/4” Front jaw assembly	2	-	X
	4	11.3/4”主颚板 Jaw 11.3/4” master	1	1	-
	5	11.3/4”前颚板 Jaw 11.3/4” front	2	-	1
	6	颚板滚轮轴 Jaw roller shaft	1	1	-
	7	颚板滚轮 Jaw roller	1	1	-
	8	平头螺丝 1/4” Capscrew 1/4”-20×1/2”	11	3	4
	9	垫圈 Washer 1/4”	11	3	4

	10	锁紧垫圈 Lockwasher	1	1	-
	11	油嘴 Lube fitting	1	1	-
	12	牙板（24768-2） die	3	3	-
	13	牙板Ⅰ dieⅠ	4	-	2
	14	颚板固定螺栓 Jaw retainer bolt	2	-	1
13.3/8	1	13.3/8”颚板总成 13.3/8” Jaw set	X		
	2	13.3/8”主颚板总成 13.3/8” Master jaw assembly	1	X	
	3	13.3/8”前颚板总成 13.3/8” Front jaw assembly	2	-	X
	4	13.3/8”主颚板 Jaw 13.3/8” master	1	1	-
	5	13.3/8”前颚板 Jaw 13.3/8” front	2	-	1
	6	颚板滚轮轴 Jaw roller shaft	1	1	-
	7	颚板滚轮 Jaw roller	1	1	-
	8	牙板固定销 Die retainer pin	4	4	-
	9	平头螺丝 1/4” Capscrew 1/4”-20×1/2”	6	-	3
	10	垫圈 Washer 1/4”	6	-	3
	11	锁紧垫圈 Lockwasher	1	1	-
	12	油嘴 Lube fitting	1	1	-
	13	牙板Ⅲ dieⅢ	4	4	-
	14	牙板Ⅱ dieⅡ	4	-	2
	15	颚板固定螺栓 Jaw retainer bolt	2	-	1

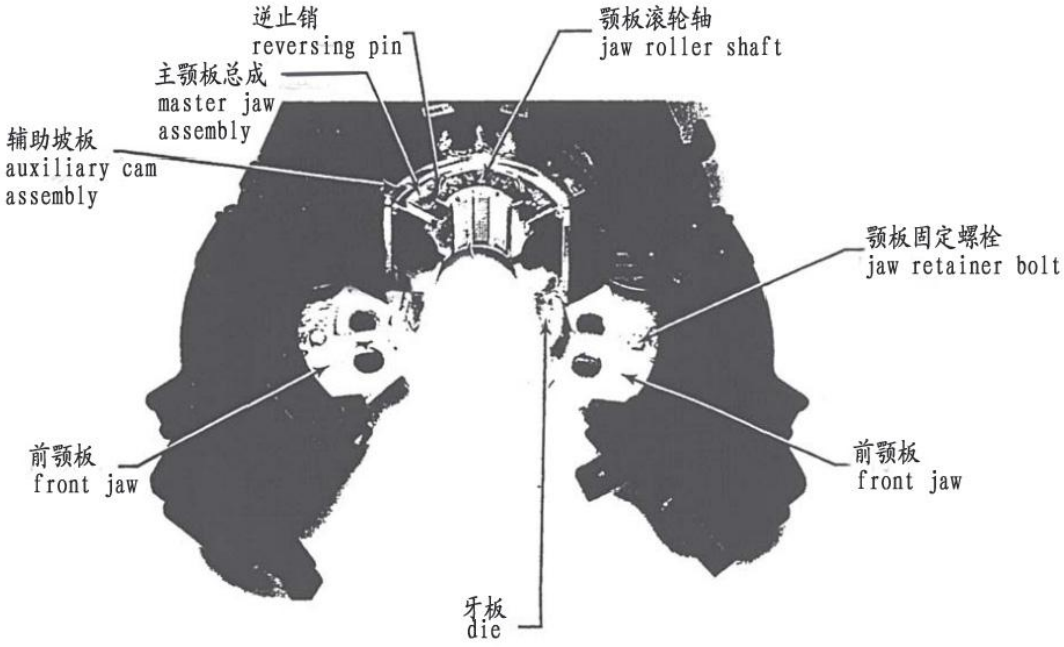

图 15　4”~5.1/2”颚板总成

Figure 15　4” through 5.1/2” jaw assembly

表 7　4”~5.1/2”颚板零件表

Table 7　Parts for 4” through 5.1/2” jaws assembly

管径 Pipe size (in)	序号 No.	名称 Description	每套钳所需数量 Req’d No per jaw set	每套主颚板所需数量 Req’d No per master jaw	每套前颚板所需数量 Req’d No per front jaw
4~ 5.1/2	1	辅助坡板 Auxiliary cam assembly	X		
	2	逆止销 Reversing pin	1		
4	1	4”颚板总成 4” Jaw set	X		
	2	4”主颚板总成 4” Master jaw assembly	1	X	
	3	4”前颚板总成 4” Front jaw assembly	2	-	X
	4	4”主颚板 Jaw 4”master	1	1	-
	5	4”前颚板 Jaw 4” front	2	-	1
	6	颚板滚轮轴 Jaw roller shaft	1	1	-
	7	颚板滚轮 Jaw roller	1	1	-
	8	牙板固定销 Die retainer pin	14	6	4
	9	牙板(16401-2) die	7	3	2
	10	颚板固定螺栓 Jaw retainer bolt	2	-	1
4.1/2	1	4.1/2”颚板总成 4.1/2” Jaw set	X		
	2	4.1/2”主颚板总成 4.1/2” Master jaw assembly	1	X	
	3	4.1/2”前颚板总成 4.1/2” Front jaw assembly	2	-	X
	4	4.1/2”主颚板 Jaw 4.1/2”master	1	1	-
	5	4.1/2”前颚板 Jaw 4.1/2” front	2	-	1
	6	颚板滚轮轴 Jaw roller shaft	1	1	-
	7	颚板滚轮 Jaw roller	1	1	-
	8	牙板固定销 Die retainer pin	14	6	4
	9	牙板(16401-2) die	7	3	2
	10	颚板固定螺栓 Jaw retainer bolt	2	-	1
5	1	5”颚板总成 5” Jaw set	X		
	2	5”主颚板总成 5” Master jaw assembly	1	X	
	3	5”前颚板总成 5” Front jaw assembly	2	-	X
	4	5”主颚板 Jaw 5”master	1	1	-
	5	5”前颚板 Jaw 5” front	2	-	1
	6	颚板滚轮轴 Jaw roller shaft	1	1	-
	7	颚板滚轮 Jaw roller	1	1	-
	8	牙板固定销 Die retainer pin	14	6	4

	9	牙板(16401-2) die	7	3	2
	10	颚板固定螺栓 Jaw retainer bolt	2	-	1
5.1/2	1	5.1/2”颚板总成 5.1/2” Jaw set	X		
	2	5.1/2”主颚板总成 5.1/2” Master jaw assembly	1	X	
	3	5.1/2”前颚板总成 5.1/2” Front jaw assembly	2	-	X
	4	5.1/2”主颚板 Jaw 5.1/2”master	1	1	-
	5	5.1/2”前颚板 Jaw 5.1/2” front	2	-	1
	6	颚板滚轮轴 Jaw roller shaft	1	1	-
	7	颚板滚轮 Jaw roller	1	1	-
	8	牙板固定销 Die retainer pin	18	10	4
	9	牙板(16401-2) die	8	4	2
	10	颚板固定螺栓 Jaw retainer bolt	2	-	1

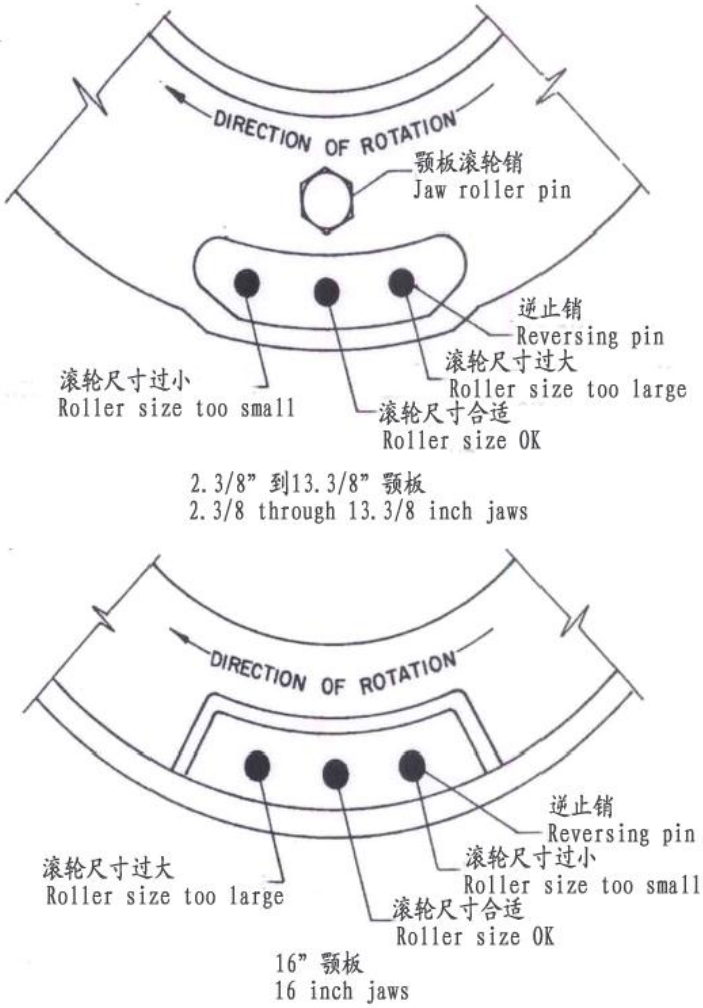

图 16 管径或滚轮过大或过小时逆止销位置示意图

Figure 16 Reversing pin indication of undersized or oversized rollers

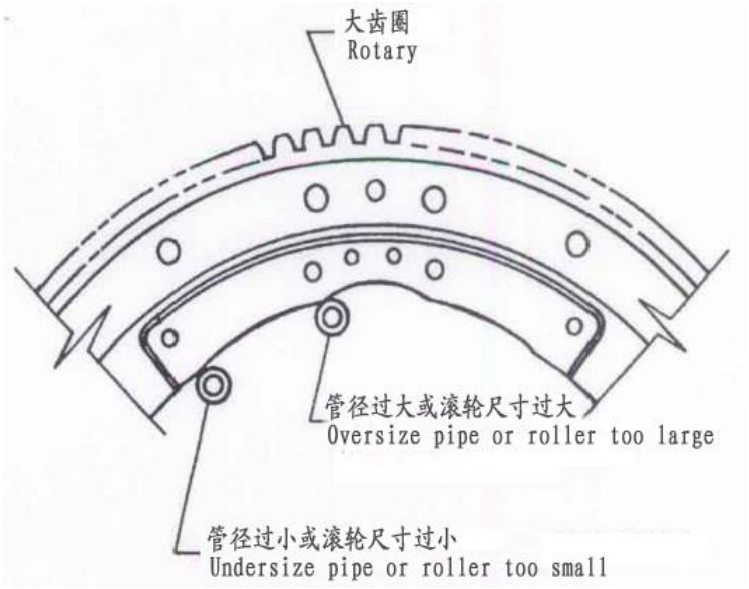

图 17 管径或滚轮过大或过小时滚轮运动示意图

Figure 17 Example of roller movement with undersized or oversized pipe or rollers

标准滚轮尺寸 Standard jaw roller sizes：

表 8 标准的滚轮尺寸

Table 8 Standard jaw roller sizes

管径（in） Pipe size (in)	钳子可达到的尺寸（in） Applicable jaw size (in)	主颚板滚轮标准尺寸（in） Standard jaw roller size (in)
2.3/8	2.3/8	1.1/2
2.7/8	2.7/8	1.1/2
3.1/2	3.1/2	1.1/2
4	4	1.5/8
4.1/2	4.1/2	1.5/8
5	5	1.5/8
5.1/2	5.1/2	1.5/8
6.5/8	6.5/8	1.7/8
7	7	1.7/8
7.5/8	7.5/8	1.7/8
7.3/4	7.5/8	1.5/8
8.5/8	8.5/8	1.7/8
8.3/4	8.5/8	1.5/8
9.5/8	9.5/8	1.7/8
9.3/4	9.5/8	1.5/8
10.3/4	10.3/4	1.7/8
11.3/4	11.3/4	1.7/8
13.3/8	13.3/8	1
13.1/2	13.3/8	1
13.5/8	13.3/8	1
16	16	1

非标准的滚轮尺寸有：1.1/16、1.1/8、1.1/4、1.3/8、1.3/4、2、2.1/16、2.1/8、2.1/4。
Useable non-standard jaw roller sizes: 1.1/16、1.1/8、1.1/4、1.3/8、1.3/4、2、2.1/16、2.1/8、2.1/4.

表 9 牙板规格

Table 9 Die size

序号 No.	名称 Name	规格 Size
1	牙板Ⅰ Die Ⅰ	31.75×12.7×79
2	牙板Ⅱ Die Ⅱ	25.4×9.5×76
3	牙板Ⅲ DieⅢ	25.4×9.5×98
4	牙板 16401-2 Die 16401-2	31.75×12.7×127
5	牙板 24768-2 Die24768-2	31.75×12.7×98

3、钳体总成和零部件明细表 Tong Case Body Assembly and Parts

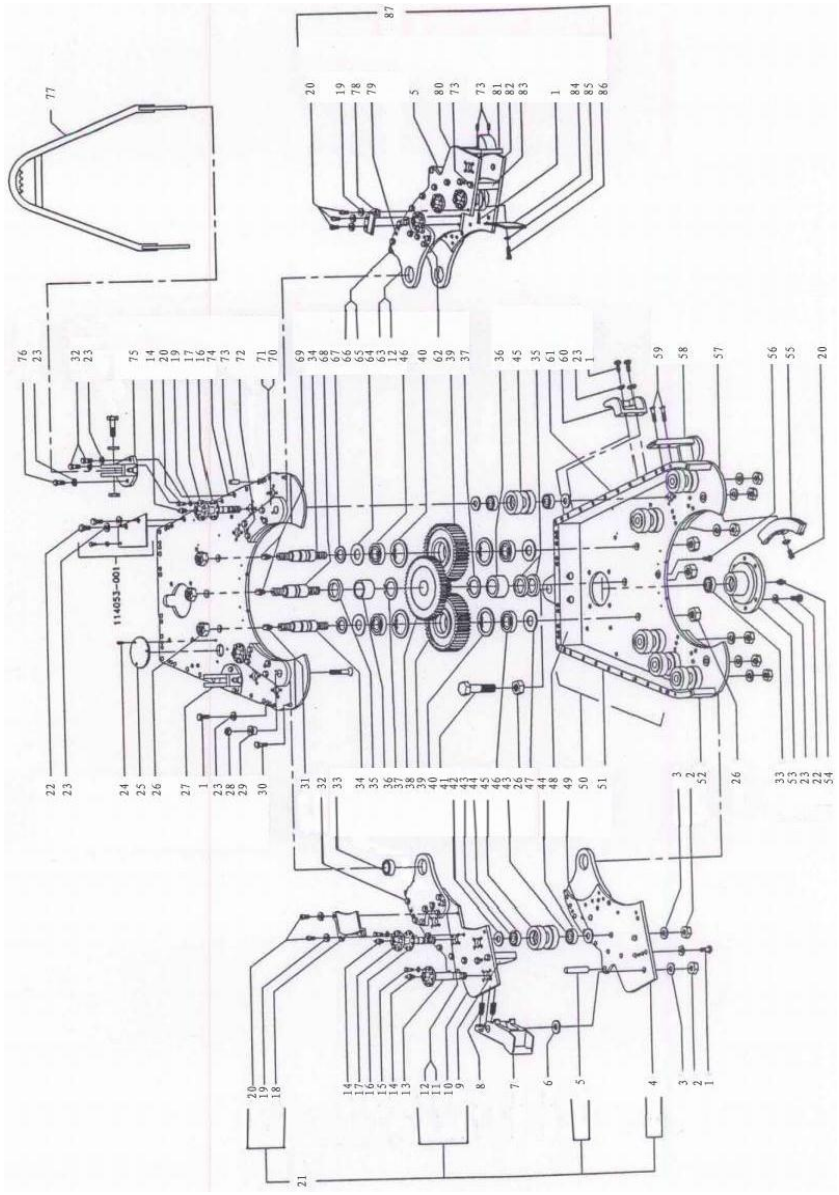

图 18 钳体总成

Figure 18 Tong case body/door assembly

表 10 钳体总成零件表

Table 10 Parts of tong case body/door assemblies

序号 No.	名称 Name	数量 Qty.
1	六角头螺栓 1/2”-13UNC×1.1/2” Capscrew, hex hd 1/2”-13UNC×1.1/2” LG	74*
2	3/4”-10UNC 六角螺母 Nut, lock 3/4”-10UNC	15
3	3/4”垫圈 Washer, flat 3/4” diameter	13
4	门闩底板 Cover bottom, latch door	1*
5	内把手 Handle, door	2**
6	止推垫圈 Washer, thrust	1
7	锁闩 Latch	1
8	锁闩弹簧 Spring, latch	2
9	门闩侧板 Side plate, latch door	1*
10	门闩上盖板 Cover, top, latch door	1*
11	连接板 Ear	3*
12	连接板垫圈 Shim, ear	4*
13	锁闩调节偏心轴 Pin, latch	1
14	1/4”-28UNF 油嘴 Fitting, grease-straight 1/4”-28UNF	13
15	六角头螺栓 3/8”-16UNC×3/4” Capscrew, hex hd 3/8”-16UNC×3/4” LG	2
16	导向滚轮垫片 Gasket, guide roller shaft	12
17	导向滚轮偏心轴 Shaft, guide roller	12
18	门鼻销滚板(门闩) Pocket rotary plunger, latch door	1*
19	3/8”垫圈 Washer, lock 3/8”	70**
20	六角头螺栓 3/8”-16UNC×7/8” Capscrew, hex hd 3/8”-16UNC×7/8” LG	38*
21	门闩总成 Latch door assembly	1
22	六角头螺栓 1/2”-13UNC×1.1/4” Capscrew, hex hd 1/2”-13UNC×1.1/4” LG	28*
23	1/2”垫圈 Washer, lock 1/2” diameter	130*
24	六角头螺栓 1/4”-20UNC×5/8”LG Capscrew, hex hd 1/4”-20UNC×5/8” LG	13*
25	盖板 Plate, cover-jam counter	1
26	六角螺母 Nut, lock, heavy, hex	7
27	起吊衡梁左支架 Bracket, bail (left)	1
28	5/8”-11UNC 六角螺母 Nut, lock 5/8”-11UNC	4
29	衬套 Bushing, door hinge	4
30	内六角螺钉 3/8”-16UNC×7/8” Capscrew, hex socket 3/8”-16UNC×7/8” LG	4
31	45°油嘴 Fitting grease 45°	1
32	六角头螺栓 1/2”-13UNC×2” Capscrew, 1/2”-13UNC×2” LG	28*
33	轴承 Bearing, roller	5
34	隋轮轴 Shaft, rotary drive pinion	2
35	止推垫圈 Washer, thrust	3
36	双联齿轮轴承 Bearing, cluster gear	2
37	孔用挡圈 Ring, retaining	2
38	双联齿轮 Gear cluster	1
39	隋轮 Gear, jam-rotary drive pinion	2
40	孔用挡圈 Ring, retainer	4
41	六角头螺栓 1”-8UNC×4.1/2” Capscrew, hex hd 1”-8UNC×4.1/2” LG	1
42	导向滚轮上垫圈 Spacer, guide roller	12
43	圆锥滚子轴承 Cup bearing	24

44	圆锥滚子轴承 Cone, bearing-guide roller	24
45	导向滚轮 Roller, guide	12
46	轴承 Bearing	4
47	止推垫圈 Washer, thrust	2
48	侧板（后） Back, case body	1**
49	导向滚轮下垫圈 Spacer, guide roller	12
50	钳体总成 Body assembly	1
51	侧板（左） Side, case (left)	1**
52	侧板（弧形）Side, curved case	2**
53	轴承底座 Cup, main drive pinion bearing	1
54	油嘴 Fitting, grease	1
55	磁体制动盘 Plate assembly, magnetic drag	1
56	大齿圈固定螺钉 Screw, rotary retainer	3
57	下盖板 Cover, bottom case	1**
58	钳脚 Leg	3**
59	内六角沉头螺钉 5/8”-11UNC×1.1/2” Capscrew, hex socket flat hd. 5/8”-11UNC×1.1/2” LG	6**
60	把手 Handle, tong	2
61	侧板（右） Side, case (right)	1**
62	圆柱销 1/2”×1” Dowel, pin 1/2”×1” LG	4*
63	门凸耳顶部连接板 Ear lug door, top	1*
64	止推垫圈 Washer, thrust	2
65	固定螺钉 Retainer door guard	2*
66	防护挡板 Guard, door	2*
67	轴用挡圈 Ring, retaining	2
68	双联齿轮轴 Shaft, cluster gear	1
69	油嘴 Fitting, grease 90 °	3
70	铰链垫片 Spacer, hinge	4**
71	铰链 Hinge, door	4**
72	圆柱销 1/2”×1.3/4”LG Dowel, pin 1/2”×1.3/4”LG	8**
73	圆柱销 1/2”×1.1/2”LG Dowel, pin 1/2”×1.1/2”LG	26*
74	上盖板 Cover, top case	1**
75	起吊衡梁右支架 Bracket, bail (right)	1
76	六角头螺栓 1/2”-13UNC×1”LG Capscrew, hex hd 1/2”-13UNC×1”LG	2
77	起吊横梁 Bail	1
78	门鼻销滚板(门凸耳) Pocket rotary plunger, lug door	1*
79	圆柱销 Pin, dowel	4*
80	上盖板 Cover, top, lug door	1*
81	扣合器 Lug	1*
82	门凸耳底板 Cover, bottom, lug door	1*
83	门凸耳侧板 Side plate, lug door	1*
84	缓冲器 Stop, lug door	1*
85	垫圈 1/2” Washer 1/2”	1*
86	六角头螺栓 1/2”-13UNC×1.3/4” Capscrew, hex hd 1/2”-13UNC×1.3/4” LG	1*
87	门凸耳总成 Lug door assembly	1

* 门闩总成和门凸耳总成的零部件 Parts of latch door assembly and lug door assembly

** 钳体总成的零部件 Parts of body assembly

4、齿轮箱总成和零部件明细表 Gear Box Assembly and Parts

表 11 齿轮箱总成零件表

Table 11 Gear box assembly

序号 No.	名称 Name	数量 Qty.
1	轴用挡圈 Snap ring-pinion gear	1
2	轴承与齿轮间的隔圈 Spacer, bearing to gear	1
3	油封 Seal, pinion shaft	1
4	上轴承 Bearing-pinion shaft-upper	1
5	轴承底座 Retainer, extension, bearing	1
6	O 形圈 O-ring	1
7	磁性螺塞 plug-magnetic	2
8	衬套 Bearing-cluster gear-thrust	1
9	离合齿轮 Gear, clutch	1
10	高低双联齿轮 Gear, HI-LO cluster	1
11	高低双联齿轮轴承 Bearing, HI-LO cluster gear	2
12	高低双联齿轮轴承(窄) Bearing, HI-LO cluster gear-narrow	1
13	止推垫圈 Washer, thrust-cluster gear-upper	1
14	高低速齿轮轴 Shaft, HI-LO cluster gear	1
15	黄油环 breather-gear box	1
16	六角螺钉 Capscrew, hx hd 3/8”-16UNC×0.75”LG	1
17	弹性垫圈 Lock washer 3/8”	1
18	定位压块 Lock-cluster gear shaft	1
19	拨叉轴 O 形圈 O-ring-shifting fork	1
20	齿轮箱密封垫圈 Gasket-gear box cover	1
21	固定销 Pin	1
22	拨叉总成 Shift fork assembly	1
23	齿轮轴总成 Gear & pinion shaft assembly	1
24	定位销 Pin	2
25	定位销 Pin-locator assembly	1
26	齿轮箱总成 Gear box and cover assembly	1
27	轴承底座与齿轮箱底密封垫圈 Gasket-ext. ring to gear box	1
28	内六角螺钉 Bolt, button, hd. socket	4
29	孔用挡圈 Snap ring-pinion shaft bearing	1
30	O 形圈 O-ring	1
31	齿轮 Gear, pinion	1
32	止推垫片 Washer, thrust	1

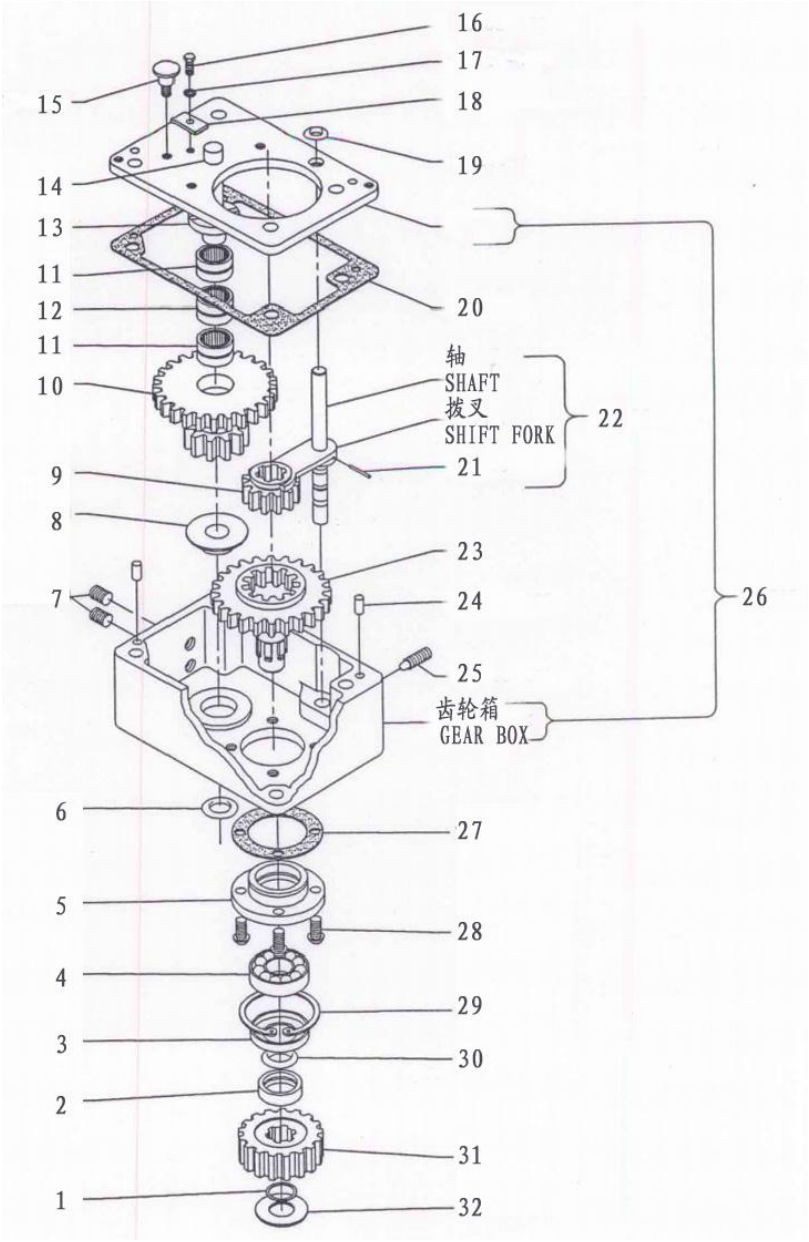

图 19 齿轮箱总成

Figure 19 Gear box assembly